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Direct and Indirect Conservation of Fossil Fuel Energy: The Influence of Financial and Philosophical Motivators and Available Human Resources

presented by

Mari S. Wilhelm

has been accepted towards fulfillment of the requirements for

PhD_____degree in <u>Family and C</u>hild Ecology

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DIRECT AND INDIRECT CONSERVATION OF FOSSIL FUEL ENERGY: THE INFLUENCE OF FINANCIAL AND PHILOSOPHICAL MOTIVATORS AND AVAILABLE HUMAN RESOURCES

Ву

Mari Wilhelm

A DISSERTATION

Submitted to Michigan State University in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Family and Child Ecology

ABSTRACT

DIRECT AND INDIRECT CONSERVATION OF FOSSIL FUEL ENERGY: THE INFLUENCE OF FINANCIAL AND PHILOSOPHICAL MOTIVATORS AND AVAILABLE HUMAN RESOURCES

ΒY

Mari Wilhelm

The development of this research was based upon a management model of motivation and available human resources for making decisions concerning the conservation of fossil fuel energy. The focus of the study was upon a measure of both direct and indirect conservation.

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The research was conducted as a secondary analysis of data collected during the evaluation of a statewide household energy audit conducted at Michigan State University. Energy consumption data from utility and oil companies served as the measure of direct conservation. Indirect conservation was investigated through analysis of self-reported participation in a variety of behaviors collectively defined as voluntary simplicity. The household was the unit of analysis for a total sample of 638 families. Multiple regression analysis served as the primary statistical procedure for testing the hypotheses. A 1.8 percentage reduction in direct household energy consumption was found between the years 1977-78 and 1979-80. Nearly three-fourths of the households were found to have practiced at least some voluntary simplicity behaviors.

Relative cost of fuel used by the household was the only significant motivator for direct conservation (p=.016). Availability of human resources did not influence direct conservation. Neither did direct conservation contribute to a sense of personal control over energy problems.

Both motivation variables and human resources were included in a significant prediction model of voluntary simplicity behaviors. Philosophical perspective contributed four percent of the variance (p=.000). Income adequacy had a negative relationship with voluntary simplicity participation but contributed only an additional 0.8 percent to the variance (p=.022). Reported skills was the strongest predictor accounting for a bivariate contribution of 10.9 percent and a multivariate 12.0 percent of the variance (p=.000). Average household education and perception of the ability to afford a conservation device also had significant contribution to the predictive model. In addition, the practice of voluntary simplicity behaviors explained 3.1 percent of the variance to the measure of personal control (p=.000).

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ii

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iii

TABLE OF CONTENTS

	F	age
LIST	OF TABLES	vi
LIST	OF FIGURES	iii
Chapt	ter	
I.	INTRODUCTION	1
	Background of Problem	1 7 8 9 16
II.	REVIEW OF LITERATURE	19
	Energy Alternatives	19 24
	of Fossil Fuel Energy	27 35 44
III.	METHODOLOGY AND HYPOTHESIZED RELATIONSHIPS	55
	Research Subsample Selection and	
	Description	57 60 63 74 81 92 94 95
IV.	FINDINGS AND DISCUSSION	99
	Participation in Direct and Indirect Conservation	100
	Fuel Energy	100

Chapter

	Per	centa	age C	han	ge ssi	in	Co An	ns al	un	ipt i s	ic	n	•	•	•	•	•	•	104
	P	ercei	ntage	Ch	ang	e i	n	Co	ns	111 111	, זמו	ic	m						106
	Mul	tiple	e Req	res	sio	n A	na	ly	si	.s-				·	•	•	•	•	200
	P	ercei	ntage	Ch	ang	e i	n	Co	ns	un	ıpt	ic	n	•	•		•	•	108
	Sum	mary	and	Dis	cus	sio	n	of	H	lyr	ot	:he	se	s	•	•	•	•	117
	Par	ticij	patio	n i	n V	olu	nt	ar	Y	Si	.mp	li	ci	ty	,	•	•	•	119
	Sum	mary	and	Dis	cus	sio	n	of	Ē	lyr	юī	he	se	ະຣັ	•	•	•	•	130
	A C	ompai	rison	of	Pe	rce	nt	ag	е	Re	edu	ice	d						
	C	onsu	nptio	n a	nd `	Vol	un	ta	ry	' 5	Sin	pl	ic	it	y	•	•	•	134
	Con	tribu	ution	of	Co	nse	rv	at	io	n	Be	ha	vi	or	s				
	t	o Per	rsona	1 C	ont	rol		•	•	•	•	•	•	•	•	•	•	•	135
	Tes	ting	the	Mod	el	•	•	•	•	•	•	•	•	•	•	•	•	•	138
v. o	VERV	IEW	• • •	•	• •	•	•	•	•	•	•	•	•	•	•	•	•	•	145
	2		. .																
	Sum	mary	of t	he	Fin	din	.gs		•	•	•	•	•	•	•	•	•	•	147
	Con	clus:	Lons	and	Im	pli	ca	ti	on	s	•	•	•	•	•	•	•	•	152
	anc																		1 5 0
APPENDI	CES	•••	• • •	•	•••	•	•	•	•	•	•	•	•	•	•	•	•	•	128
Annendi	v																		
пррепат	~																		
	Δ	Perc	renta	ae	of '	HOU	SP	ho	14	S	Re	no	r+	in	a				
	** •	Ac	reem	ent	+0	Ph	i 1	05	on	hi	ca	ĩ		-	.9				
		S	atem	ent	s C	ond	er	ni	na	Ŧ	lne	ra	v	an	Б				
		C	nser	vat	ion	. 1	97	9		_		- 3	1						159
		0.		vuc	-011	, -		2	•	•	•	•	•	•	•	•	•	•	100
	в.	Perc	centa	ae	of 1	Hou	se	ho	ld	s	Re	no	rt	in	a				
		Ac	reem	ent	to	St	at	em	en	ts	F	lea	ar	di	.nc	1			
		Pe	erson	al	Con	tro	1	0v	er	E	lne	rq	v		-	,			
		Pi	coble	ms		•			•	•	•		-						160
						•	•	•	•	•	•	•	•	-					
	с.	Volu	intar	y S	imp	lic	it	у	Sc	or	e	(1	98	0)	Ł	y			
		Ca	atego	ric	alÌ	Lev	el	⁻ 0	f	Cc	ns	er	va	ti	.or	າ			
		Ad	ction	s T	ake	n	•	•	•	•	•	•	•	•	•	•	•	•	161
•																			
BIBLIOG	RAPH	Υ.		•	•••	•	•	•	•	•	•	•	•	•	•	•	•	•	162

Page

LIST OF TABLES

•

Table		Page
1.	Selected Household Characteristics-Comparison of Research Subsample, 1978, and Michigan Households	61
2.	Selected Household. Comparison of Research Subsample, 1978, and Michigan Households	62
3.	Percentage Change in Household Consumption 1977-78, 1979-80	65
4.	Percentage of Households Reporting Participation in Voluntary Simplicity Behaviors	67
5.	Participation in Voluntary Simplicity Behaviors: Total Scale and Subscale Mean Scores and Categorical Percentages	71
6.	Factor Analysis of Voluntary Simplicity Behaviors	72
7.	Household Income Adequacy Levels, 1979	76
8.	Household Scores on a Measure of Philosophical Energy Perspective, 1979	80
9.	Summary Data of Human Resource Variables	91
10.	Personal Control, 1980	93
11.	Comparison of Participation in Voluntary Simplicity Behaviors and Reduced Household Energy Consumption	101
12.	Bivariate Regression Analysis with Percentage Change in Consumption as the Dependent Variable and Motivators, Human Resources and Demographics as Independent	
	Measures	107

Table		Page
13.	Hierarchial Multiple Regression Analysis with Percentage Change in Consumption as the Dependent Variable	110
14.	Percentage Reduced Consumption by Philosophical Perspective by Income Adequacy	112
15.	Bivariate Regression Analyses with Total Voluntary Simplicity Scores as the Dependent Variable and Motivators, Human Resources and Demographics as Independent Variables .	123
16.	Hierarchial Multiple Regression Analysis with Total Voluntary Simplicity as the Dependent Variable	126
17.	Regression Analyses with Direct and Indirect Measures of Conservation as Dependent Variables and Motivators and Human Resources as Independent Variables	136
18.	Bivariate Regression Analysis with Personal Control as the Dependent Variable	139
19.	Multiple Regression Analysis with Personal Control as the Dependent Variable and Conservation, Motivators, Human Resources, and Contextual Variables as Independent Variables	140
A-1.	Percentage of Households Reporting Agreement to Philosophical Statements Concerning Energy and Conservation, 1979	159
B-1.	Percentage of Households Reporting Agreement to Statements Regarding Personal Control Over Energy Problems	160
C-1.	Voluntary Simplicity Score, 1980, by Categorical Level of Conservation Actions Taken, 1980.	161

والمستشد فتطاريه

LIST OF FIGURES

.

_

Figure		Page
1-1.	Management Model for Conservation Behavior .	15
4-1.	Percent Change in Consumption by Knowledge by Income Adequacy	114
4-2.	Percent Change in Consumption by Age by Income Adequacy	115
4-3.	Percent Change in Consumption by Rurality by Fuel Type	116
4-4.	Mean Voluntary Simplicity Score by Skill Level and Income Adequacy	131
4-5.	Mean Voluntary Simplicity Score by Education by Income Adequacy	132
4-6.	Path Analytic Model Showing Direct and Indirect Relationships Between Motivators, Resources, Conservation Behaviors and Demographics	144
4-5. 4-6.	Mean Voluntary Simplicity Score by Education by Income Adequacy	132

CHAPTER I

INTRODUCTION

Background of Problem

Carver (1924) noted that the basic problem of living living was, in fact, a problem of conserving energy. The focus of his statement was the economy of human energy as a rationalization for increased use of fossil fuels. Carver also pointed out that when coal and oil were exhausted; wood, alcohol, waterwheels, windmills and solar engines would provide viable energy alternatives. Nearly sixty years later, evidence supporting the limitations of fossil fuel reserves has brought the energy alternatives mentioned by Carver, as well as others, under serious consideration as substitutes for finite fossil fuels.

The use of fossil fuel resources in the United States has increased steadily over the years in an effort to improve the level of living. Considerable utility has been derived from their use. Labor saving devices, powered by fossil fuels, made leisure time a reality. Travel became much less difficult and considerably faster. Services were provided at a high enough level outside the home that the household became a center for consumption of goods and services. Consumption would become a symbol of a household's quality of life.

Awareness of the limitations of fossil fuels to meet the energy demand has been a major concern of the last decade. The focus of this concern was frequently based on the dependency of the American lifestyle on fossil fuels for abundant and inexpensive energy resources. The increasing demand for energy coupled with the rising prices of imported fuels and the extensive cost of extracting less easily accessible fuel sources would eventually result in less energy available for consumption (LeGrand and Robinson, 1980).

Concern over loss of the benefits of fossil fuel energy has led to speculations about future energy lifestyle alternatives (Ford Foundation, 1974; O'Toole, 1976; Lovins, 1977; National Research Council, 1979; Stobaugh and Yergin, 1979; Toeffler, 1980; Schurr, et al., 1980). In general, the various lifestyle alternatives range from continued growth through use of nuclear power to extensive cutbacks in consumption of energy.

The Ford Foundation (1974), for example, identified three future energy scenarios. The Historical Growth Scenario is based on the assumption that consumption of energy resources would increase at about 3.4 percent annually. This growth would require aggressive efforts to

balance supplies of energy with increasing demand through development of all energy resources including nuclear power.

The second scenario, Technical Fix, included an increase in the energy growth rate of approximately 1.9 percent annually to the year 2000. Through a conscious effort towards more efficient use of energy resources this scenario would consume one-third fewer British thermal units (Btus) than the Historical Growth Scenario. Application of energy conserving technologies would be expected to improve both direct energy savings and indirect savings from energy processing.

The third scenario, Zero Energy Growth, involved social and economic systems which are based on a harmony with the natural environment. Economic growth would be expected to continue through production of durable goods and a larger proportion of services. Conservation would be accomplished through technical fixes and fewer purchases of material goods.

As the population became aware of a potential energy shortage, technology frequently was turned to as the answer. Technology may be answering the questions concerned with increasing energy supplies, however, the more appropriate question might be the extent to which energy is required and beneficial to society.

Amory Lovins (1977), an advocate of soft technology, questioned whether the Historical Growth Scenario, or as he called it, the Hard Technology Path, was truly the answer

to societal goals. He pointed out that continued use of oil and coal at the present level and increased development of nuclear power would continue present inefficient use of energy resources. In addition, he noted the steep investment of capital necessary for such developments. Lovins proposed that where energy was concerned, we ask questions concerning what energy source would be best for which particular purpose.

Lovins claimed that premium fuels have been used inefficiently in places where other energy resources could accomplish designated goals equally well without being wasteful. In addition to efficient use of fossil fuels through technical fixes, Lovins supported what he called soft energy technologies. Technical fixes included, among others, insulation, heat pumps, and proper ventilation. Soft energy technology included the use of renewable energy resources such as the sun, wind, and vegetation.

Decisions being made at present determine our personal as well as our economic future. Lovins as well as other critics of our present pattern of economic progress suggested that while making economic decisions regarding allocation of scarce resources it is necessary to incorporate social decisions into the process. It is their position that society can maintain a level of living comparable to present standards while enhancing a quality of living based on personal and human values. This would, however, require an assessment of our current consumption

and production patterns (economic decisions) in relation to societal values and goals (social decisions).

Theorists supporting Zero Growth or Soft Path Technology Scenarios claimed that their ideas for solving the energy dilemma have fewer long term liabilities and greater societal benefits. Such proposed scenarios vary in scope and intensity. Some suggest a reorganization of the production-consumption system; others propose a back-tothe-land lifestyle.

Morrison and Lodwick (1981) suggested that the claims made by soft energy advocates should be treated as hypotheses to be tested. Information gained related to the claimed impacts would be beneficial to policy. Nelson and Honnold (1976) also suggested that the lifestyles proposed by conservationists may be contrary to what is known through sociology and psychology about behavior; primarily that consumption fulfills a status need. Ashby (1977) suggested that we first need to begin to find out what people are actually doing in terms of alternative lifestyle changes.

It appears that during the decade of the eighties, the following questions concerning lifestyles and energy may grow increasingly important: Which persons are actually behaving in ways positive to conservation of fossil fuels? What factors or characteristics contribute to this behavior? What are the impacts of this behavior?

Approximately two-thirds of the direct and indirect consumption of energy can be attributed to the choices and patterns of living in the American households (Hannon, 1975). Direct consumption of energy represents slightly less than one-half of household consumption and is used primarily for transportation and space and water heating. Indirect consumption of energy occurs when households make purchases of goods or services which require energy for production, storage, and transportation to market. This consumption exceeds slightly the amount of energy consumed directly by households.

Due to the large amount of energy consumed, households are recognized as primary decision makers involved in both direct and indirect consumption. Purchase decisions made within the household have both short and long range implications for energy use. For example, a large portion of the energy used within the home has been determined by previous lifestyle decisions such as where to live and what kind of house to own. Previous purchases of various household appliances are other contributors to lifestyle demands on energy resources (Morrison and Gladhart, 1976).

Making lifestyle decisions based on the fulfillment of goals or wants requires the accessibility of resources. During the last several decades fossil fuels have been readily available as an energy resource. As the limits of fossil fuel supplies have become evident, allocation of energy by households for direct and indirect consumption

has come under considerable scrutiny. The household has been viewed as a possible source of direct conservation and potential source for production of goods and services for future less energy intensive lifestyles. Little is known, however, concerning the motivation involved in adoption of less fossil fuel intensive lifestyles.

Purpose of the Research

The primary purpose of this research was to determine if there were differences in the adoption rate of direct and indirect conservation behaviors among households of various income adequacy and philosophical energy perspectives. Direct conservation was investigated through analysis of annual residential energy consumption over a period of three years. Indirect conservation was investigated through analysis of self-reported participation in a variety of behaviors reflecting self-sufficiency, recycling, and contributions to ecological organizations. These behaviors have been collectively defined as voluntary simplicity.

A second purpose of the research included testing the influences of available human resources within the household on the motivation to practice direct and indirect conservation. Thirdly, the research explored the impact of participation in conservation behaviors on the development of a sense of personal control over energy issues. Personal control was measured through analysis of self-reported answers to five locus of control questions modified for energy use.

Research Questions

In an effort to contribute to the knowledge concerning actions adopted by households which relate to present issues of energy and lifestyle and the factors which contribute to these actions the following research questions were posed:

- With what frequency are households reducing direct consumption of fossil fuel energy and with what frequency are they participating in behaviors related to voluntary simplicity?
- 2. To what extent are indicators of income and philosophical perspective towards the energy issue related to a household's reduction in direct energy consumption and/or participation in voluntary simplicity behaviors?
- 3. To what extent does the availability of human resources influence the relationship between indicators of income and philosophical perspective and a household's reduction in direct energy consumption and/or participation in voluntary simplicity behaviors?
- 4. To what extent does participation in voluntary simplicity and/or reduction in household energy consumption contribute to a family's feeling of control over energy related stressors?

Conceptual Framework

Management within the household is directed toward the allocation of resources for the fulfillment of goals. It implies that there can be control over the process and the outcome of an event.

A managerial perspective includes four basic concepts: values, resources, decision making, and goals. Values have been defined as personal preferences and beliefs about what is desirable (Hungerford, 1978). The expression of values can occur in a variety of ways. Values may be expressed culturally through norms and role expectations. In an economic system the value of a resource or an end product is also expressed through its media of comparison or exchange value which is more commonly referred to as price or cost. According to Deising,

It is the value system of a culture which determines the extent to which ends can be alternative, which makes some means normative and others neutral, and which allows media of value comparison to develop (Diesing, 1972, p. 46).

Ashby (1977) maintained that the value of a resource to the household can be assessed from four definitional components. They include cost of the resource within the marketplace, usefulness derived from its consumption, symbolic value attributed to benefits derived, and beauty.

Within the context of managerial theory values are said to influence the development of goals. Values may thus be expressed in terms of goals or wants. Values are

also said to motivate the use of resources while attempting to satisfy goals (Nickell, Rice, and Tucker, 1976; Paolucci, 1977).

Goals are frequently described as wants. In most. if not all cases, an individual or group has more than one goal. Resources provide the means whereby goals are successfully attained. Resources may be tangible commodities such as tools or raw materials. Resources may also be intangible such as time, skills, or knowledge. In addition, resources can be said to be human or nonhuman. Money is a nonhuman resource whereas self-esteem or motivation would be considered psychological human resources (Rice, 1969). When resources are plentiful they can be more easily used to satisfy a variety of alternative goals. When resources are scarce they must be allocated to specific goals. This allocation requires a more conscious process of decision making for goal satisfaction (Gross, Crandall, and Knoll, 1973).

It is the decision making process that is the controlling factor in the choice of outcome and effective use of resources. When the outcome is not determined through a conscious choice among alternatives, less efficient use of resources may occur. Diesing (1972) identified five types of rationality, two of which are useful for discussion of the decision process relevant to this research. Economic rationality was described as continuous measurement, comparison, ordering and exchange of

commodities. The objective of economic rationality is the transformation of resources into maximum value. Social rationality was described as concerned with joint action based on shared meaning, trust, and mutual support. The objective of social rationality is the attainment of goals through use of resources.

Values have been linked to social decisions and the allocation of resources to economic decisions (Paolucci, 1966). Through the conscious allocation of resources, households make economic decisions among alternative ends. Through interactions among individual members, households make social decisions. Control exercised over the choice between alternative ends and the allocation of resources are said to be motivated by values.

An ecological-systems approach was introduced to facilitate study of the management process within the family (Steidl, 1969; Hook and Paolucci, 1970). This perspective allows for the conceptualization of the iterative process of management. In other words, rather than being involved in cause and effect relationships, management concepts are interdependent. For example, values are said to influence the choice among alternative goals and to motivate the allocation of resources towards the achievement of those goals. According to a family ecological model, however, a shift in the availability of resources can create changes in the choices made between various goals.

In addition, availability of resources is identified as an important component to the process of value development.

The family ecological approach facilitates a focus on the interrelationship between the household and the context in which managerial control is being exercised. This context has also been referred to as the environment. Three subenvironments have been defined and include the natural environment, the human-made environment, and the social-emotional environment (Morrison, 1974; Bubolz, et al., 1979).

Resources are available to families from each of the various environments. When a change occurs in one subenvironment, changes will also occur in the other subenvironments. In the case of energy, limits of fossil fuel resources available from the natural environment will follow with changes in each subenvironment including the natural environment. Therefore, decisions regarding the use and development of resources from each area are critical.

A shift in the availability of resources can create change through a reallocation of that particular resource along with reallocation and substitution of other available resources. Rice (1969) proposed an economic framework for assessing managerial behavior in which she stated:

Change occurs in the family (individual or household) when its values are expressed in terms of wants (or goals) strongly enough

to cause decisions which direct behavior in the use of resources to increase or decrease production and consumption (Rice, 1969, p. 6).

A discrepancy between what is and what one expects or wants may create change by setting into motion a process of decision making. Change in reaction to the energy crisis was discussed by Perlman and Warren (1977) as a processing of information whereby the system first notes an incongruency between what is actually occurring and the standard for what should occur.

Until recently the comparison value of fossil fuels in respect to other energy resources has been relatively low. Since 1973 sources of natural gas and fuel oil have increased rapidly in price and supplies have been interrupted. This has meant that households are paying increasingly larger percentages of their income for home heating, electricity, and transportation.

The symbolic value of fossil fuels as a resource could be described in terms of the interrelation between the shared meanings of a society, social interaction, and the individual (Schmitt and Grupp, 1976, p. 325). From this perspective fossil fuel energy could mean a warm house, ability to travel to visit family or friend, a sports car, stylish clothing, or a way to get what is desired out of life. For others, it might mean pollution, inequitable distribution of wealth, or an impersonal market economy.

Conservationists have been quick to identify and focus on the less positive of the symbolic meanings of fossil fuel energy. They have suggested that society has focused on meanings of energy which are directed towards short-term benefits rather than long-term lifestyle values. In the process, values for the social good may be forfeited.

The purpose of this research was to explore the impact of income adequacy and philosophical motivators and the availability of specific human resources on the practice of direct and indirect conservation. Figure 1 depicts the underlying theoretical model.

Income adequacy, philosophical perspective, and resources interact within the decision process. The immediate outcome of the decision process is the allocation of resources to a variety of behaviors. In this research the behaviors were specifically defined as structural and behavioral changes related to direct conservation and voluntary simplicity behaviors. Both aspects of behavior in the model were expected to lead to either direct or indirect conservation of fossil fuel energy. A predicted outcome of participation in conservation was the production of motivation and resources upon which to draw at a later time.

As with all models, only certain variables can be observed within one research topic. Variables studied in this project are defined below.





Definitions

Income Adequacy

The assessment of the adequacy of the total money income of the household unit. This indicator was based on expenditure and need studies and was then adjusted for household composition and geographic residence. This was an objective indicator of the household's financial ability to purchase resources which have an exchange value within the marketplace.

Philosophical Perspective

An assessment of the symbolic value of fossil fuel energy to the respondent. This measure was based on the respondent's subjective orientation to issues or problems of energy consumption.

Knowledge of Conservation Actions

The ability of respondents to identify efficient methods of direct conservation of fossil fuels.

Average Household Education

The educational attainment of the principal adult(s) within the household.

Reported Home Repair Skills

The extent to which the respondent perceived household members capable of performing various household repairs.

Perceived Money Availability

The respondent's personal assessment of the household's ability to make purchases of equipment or devices which would facilitate fossil fuel conservation.

Perceived Time Availability

The respondent's personal assessment of the amount of time that household members could contribute to the installation of a conservation device.

Human Labor

The total number of household members who could potentially replace fossil fuel energy with human energy.

Number of Employed Household Members

Participation of household members within the labor market outside the household.

Personal Control

Subjective assessment of the respondent's competence, achievement and individual efficacy in managing problems related to energy consumption.

Voluntary Simplicity

The respondent's judgment of the extent to which households participate in behaviors which have been theoretically defined as a less energy intensive lifestyle. The behaviors are considered indirect conservation based on reduced purchase of material goods and substitution of human energy for fossil fuel energy.

Percentage Change in Consumption

An objective measure of direct consumption of fossil fuel energy within the household. This measure was based on actual meter readings obtained from utility companies for the years 1977-1978 and 1979-1980.

CHAPTER II

REVIEW OF THE LITERATURE

Energy is a vital resource for living. Looking at energy from a historical perspective O'Toole (1978) pointed out that the importance of energy is relative to the ability of man/woman to perceive and harness the energy for use. O'Toole further maintained that history has shown that people can and do make choices among the use of alternative technologies; that changes in use of various energy forms needs not create disaster yet they often result in social change.

Energy Alternatives

The increasing awareness of the finite characteristics of present fossil fuel energy sources has created considerable concern regarding our energy future. Immediate reactions tended to display a sense of crisis (Morrison and Gladhart, 1976; Boulding, 1974; Perlman and Warren, 1977). More recently, however, the limitations of fossil fuels to meet future energy demands have resulted in the recognition of numerous alternative energy sources. LeGrand and Robinson (1980) noted that two objectives in the allocation of resources to

alternative ends were the achievement of social efficiency and social equity. The allocation of resources to energy alternatives requires consideration of these objectives through time as well as in the present.

At present, natural gas and fuel oil provide approximately 75 percent of the energy used within our nation. These energy sources are nonrenewable and the domestic supply and production of fuels from fossil fuel sources is said to have begun an irreversible decline (National Research Council, 1979). Responses to a decline in an available resource traditionally have involved attempts to increase supply. Alternative energy sources such as coal, nuclear power, biomass, geothermal, wind, and solar are possible substitutions for natural gas and fuel oil to increase supplies of energy. Human labor is another potential energy resource.

Control over demand for energy resources, i.e., conservation, has also been given considerable attention (Wolf, 1979). One aspect of conservation has been directed towards limiting the extraction of fuels from the ground. Another perspective of conservation has been described as efficient use of energy resources.

Natural gas and fuel oil have provided an efficient inexpensive source of energy. Increased use has been associated with economic growth and, therefore, our present level of living. Reduction or change in the use of energy

may frequently meet with resistance due to concern over a potential lowered level of living.

As a result, a variety of future energy scenarios have been identified and described (Ford Foundation, 1976; National Research Council, 1979; Williams, Kruvant, and Newman, 1979; and Amory Lovins, 1977). In general they each predict two basic future alternatives: increased supply or decreased demand. (The scenarios of the Ford Foundation were discussed in Chapter One.)

Williams, Kruvant, and Newman studied the energy consumption of a national sample of household consumers. Based on actual energy consumption in 1972 and 1974 and an analysis of conservation attempts the authors sought to identify impacts of alternative energy futures. Four futures were identified: Business as Usual, Conservation Incentives and Mandates, Acute Shortage, and High Electricity. Each future was discussed from analysis of the potential impacts on metropolitan trends of housing, land use, employment and transportation. The population of households was broken down according to five variables to facilitate analysis. These variables included: income (adjusted for family size and geographical location), location, race, age, and family size.

The authors predicted few metropolitan changes in the Business as Usual and Acute Shortage Scenarios. A period of acute shortage would be likely to result in decreased housing availability and a shift to public

transportation. Households with adequate income resources would be least affected. On the other hand, low income, black, and older populations would experience the most negative impacts.

The High Electricity scenario would mean abundant energy from development of coal and nuclear technologies. Growth would be expected to continue at present rates.

The Conservation Incentive and Mandate Program would be expected to introduce greater change. The additional input of capital to promote conservation would be expected to result in increased prices for housing and land. A movement towards back to the city and public transportation was also predicted. Once again higher income households would be expected to be least affected. Cost of housing and energy efficient transportation would impact primarily on low-income families. Larger families residing in the suburbs would also be expected to experience a squeeze on the pocketbook.

Amory Lovins (1977) discussed energy futures in terms of hard and soft paths. The hard energy path would be similar to the Historical Growth scenario of the Ford Foundation and the High Electric scenario described by Williams, Kruvant, and Newman.

Lovins described the soft energy path as involving aspects of both supply and demand. Supply of energy would result through the use of renewable energy sources and the harnessing of less environmentally harmful energy sources
such as solar. Since these sources of energy would not provide the one overall inexpensive and efficient energy resource, the soft path also incorporates restraints on the demand for energy.

Wolfe (1979) viewed the soft path from two perspectives: alternative technology and conservation. Conservation was perceived to occur through technical efficiency within the household and patterns of use based on lifestyle and value change. Changes related to lifestyle could occur through voluntary or mandated behavior.

All too frequently decisions related to the choice among energy alternatives are concerned merely with the immediate availability of fuel to meet wants and needs. The basic objectives of social efficiency and social equity if included in the decision process may receive short-term consideration rather than the long-term, throughout time consideration suggested by LeGrand and Robinson (1980).

Edney (1980) noted that shortages and equality in the common social unit cannot exist together in a society where self-sufficiency requires the scarce resources for functioning. Resolution of scarcity problems in a democratic community, according to Edney, should be focused on alternatives which would preserve individual choice; should not cause long-term problems; should be based on current technological capabilities; and should not create drastic lifestyle changes.

Edney further suggested that the dilemma of choice was not one of individual versus group rationality but rather a conflict of human values. Values of identity, competition, survival, freedom of choice, and social power may conflict with those focused on the common good. Stern and Gardner (1980) suggested that energy conservation from a commons framework is a problem of motivating persons to act in ways that promote lifestyles based on long-term social interests.

Energy and Lifestyle

Nader and Beckerman (1978) referred to lifestyle as the expression of value preferences through consuming behaviors. Value preferences or lifestyles are dynamic rather than static. Lifestyles will change as energy sources change throughout time.

Nader and Beckerman noted differences between lifestyle changes and mere behavior change. Specifically they stated that lowering thermostats or carpooling would not be considered lifestyle changes. Rather they suggested that lifestyle refer to broader changes in social values or ideologies. They identified four: investment and reinvestment, hoarding, consumption, and work. A conflict of values appeared to be the common denominator in the relationship of lifestyle and energy. This is similar to the identification of a "Commons dilemma" discussed by Edney (1980). Lifestyle is frequently used synonymously (although incorrectly), with quality of life. Quality of life is sometimes measured in terms of goods and services available for use. This measure is nearly always related to the Gross National Product and thus with production and consumption.

Nader and Beckerman (1978) noted that several of the theorists they reviewed¹ had agreed that social change and social action were constrained by the amount of energy available. They noted, however, that within the last three decades energy theorists had not identified changes as necessarily higher, better, or more desirable. This is the view taken by Lovins and other conservationists in support of soft path energy technologies and the incorporation of social as well as economic considerations into energy decision-making.

Households are responsible for two-thirds of the direct and indirect consumption of energy (Hannon, 1975). Morrison and Gladhart (1976) noted that a great deal of consumption occurs as a result of "non-decisions" on the part of families. What they in essence were saying is that families or households form patterns of behavior which result in the consumption of energy. Such family tasks as preparing food, maintaining the household, and providing recreation require direct consumption of energy.

¹Theorists reviewed included Odum (1971), Cottrell (1955), Adams (1975), and White (1959).

Gladhart (1977) studied what he defined as lifestyle decisions and their relationship to energy consumption. Data were collected in May of 1974 on a sample of 216 urban and rural households in Michigan. Using regression analysis to control for the effects of other variables, the specific contribution of various lifestyle features to energy conservation were determined.

Findings indicated that multiunit and mobile dwellings used considerably less energy than single family dwellings. Houses with more insulation and houses with fewer doors, windows, and heated rooms required less energy to heat. Households without children and households with older families were also found to use less energy. There was no important difference identified between urban and rural families residential energy use. Rural families, however, used 42 percent more gasoline. This difference was noted for travel to work, shopping for food, and transporting children to activities.

It should be noted that the conceptualization of lifestyle used by Gladhart would have been discussed by Nader and Beckerman as patterns of behavior indicative of lifestyle or value preferences rather than the lifestyle itself. None-the-less, recognition of these behaviors is important. Gladhart maintained that changes made in behavior patterns which may contribute to conservation in one sense might result in consumption in another. Change in one behavior alone will not conserve

fossil fuels if not considered in the context of all lifestyle behaviors. Since conservation may result in dollar savings, the reallocation of that money needs to be for goods and services which are also less energy intensive.

Reduction in Household Consumption of Fossil Fuel Energy

The present study was directed towards understanding the motivations and household characteristics which facilitate conservation of fossil fuel energy. It is, therefore, necessary to briefly discuss research related to household energy consumption.

Based on an analysis of two studies, Grier and Grier (1978) identified three structural factors and a variety of population characteristics which influence consumption. Lowered population density of residential communities, smaller households, more adults per household, more workers per household, more elderly people and greater affluence all contribute to higher overall consumption of energy.

Several of these population trends also have potential for conservation. Affluence may afford households the ability to equip homes with energy saving technology therefore providing a potential area of conservation. In addition, higher income households due to initial higher levels of consumption may have more flexibility to conserve.

A second trend noted by Grier and Grier was a backto-the-city movement thus increasing the population density of residential areas. As these homeowners implement renovation of older homes, energy efficient technology can be

incorporated. In addition, energy costs for transportation may be evidenced. These benefits may be lost, however, if affluent households returning to the city bring with them energy intensive lifestyles.

Perlman and Warren (1977) reported that the impact of the 1973-74 energy crisis was limited in the majority of 1440 households interviewed in their study. The main impact was primarily a change in the material resources available to families. They specifically identified money and gasoline as scarce resources. A few households suffered reductions of income through job loss; others noted a change in the availability of various goods and services.

Changes in behavior related to noted impacts were assessed through analysis of self-reported data on household uses of energy for transportation, heating, lighting, cooking, and air-conditioning. Estimates were made on the amount of energy actually consumed before and during the oil embargo. All figures were converted into British thermal units. A comparison was made based on the proportion of precrisis energy that was saved as a result of reported behavior changes. Overall, reports indicated a 12 percent reduction during the year following the oil embargo.

Self-reported conservation estimates were validated by obtaining actual copies of the utility bills from a subsample of the total 1440 households in the study. A

comparison of actual consumption and estimated conservation showed that while households somewhat overestimated their attempts at conservation, the amount of energy actually saved was only slightly lower than the estimated figure. Btus saved on heating were estimated at 15.9 million British thermal units (MBTUs) actual consumption records showed a savings of 10.3 MBTUS. Conservation of energy used for other household purposes was estimated at 4.8 MBTUs, actual savings however, were not observed.

Perlman and Warren reported that income differences in families resulted in differences in conservation behaviors. A direct linear relationship was reported between income and absolute reduction in direct household energy consumption. Proportion of energy saved showed a slightly curvilinear pattern. Households with income under \$5,000 and greater than \$15,000 reported a similar reduction of approximately twenty-five percent. A slightly lower reduction was reported by other household income groups.

William, Kruvant, and Newman (1979) reported on actual consumption data of a national sample of households during 1972 and 1974. Their findings showed a 1.8 percent overall decrease in energy consumption. The reduction was noted primarily in apartment dwellings (-3.3% change) as compared to single family dwellings (0.2% increase); the older, over sixty-five population (-7.1% change) as compared to

middle-aged persons (1.4% increase); and central city residents (-4.9% change) as compared to suburban (-2.4% change) and rural (1.0% increase) residents.

A large portion of energy research directed to the study of conservation has resulted from the work of the Family Energy Project at Michigan State University. Their work included data based on self-reported conservation actions as practiced by households, but also included actual measures of conservation as reported through changes in direct consumption over time. Consumption data were obtained from appropriate utility companies once permission was given by the household.

Hogan (1976) hypothesized that household energy conservation practices would differ among husbands and wives with varying commitment and congruency to selected values. Four values were studied separately: self-esteem, familism, social responsiveness, and ecoconsciousness. Using one-way analysis of variance, she found that commitment to ecoconsciousness was the only value which contributed to differences in adoption of conservation practices. Those families with high commitment to ecoconsciousness adopted 72 percent of the practices compared to 46 percent by families with low commitment.

Hungerford (1978) examined the relationship of value commitments to residential energy use. Initial analysis showed that households reduced gas consumption by nine percent and fuel oil by 15.6 percent. Electricity was

reduced but not significantly. Stepwise multiple regression was used to investigate the relationship of value commitment and residential energy consumption. Results indicated that an increase in husbands' ecoconsciousness value was related to an increase in consumption whereas an increase in the wife's ecoconsciousness value was associated with a decrease in consumption.

Further analysis looked at the relationship between congruency of a husband's and a wife's ecoconsciousness value and change in consumption (1974-76). Ecoconsciousness value scores of husbands and wives were categorized as congruent and incongruent. Congruency was not found as a significant aspect of change in consumption. An analysis of the differences in ecoconsciousness congruency patterns found the greatest reduction in consumption in households where the wife had high commitment and the husband had a medium commitment to values of ecoconsciousness.

Keith (1977) investigated household microdecisions related to energy consumption and their relationship to changes in consumption levels from 1973-74 to 1975-76. Data concerning family microdecisions were collected from selfadministered questionnaires completed by both husbands and wives (or single parents) of one hundred and thirty households. In addition, a scale was developed to determine a composite measure of conservation practices in which responses were weighted according to intensity of practice and number of adults.

Keith found an overall reduction in Btu consumption of 6.3 percent (p=.000). When controlling for fuel type, electricity showed a slight nonsignificant increase in consumption. Fuel oil users showed a greater decrease (ll.1 percent) when compared with natural gas users (6.6 percent).

A significant predictive model of conservation included three variables: addition of a new furnace, increased intensity of conservation behaviors, and addition of ceiling insulation. When electricity was weighted to account for conversion and transmission the stepwise regression model included change in the number of people.

Morrison, Keith, and Roosa (1978) studied characteristics of conserver and nonconserver households by comparing their scores on eighteen variables. Discriminant analysis was used in order to identify variables which would measure expected differences between the two groups.

Morrison et. al., reported that households which actually reduced their direct consumption of energy (conservers) tended to be significantly (p=.013) more aware of their conserving behaviors. The conserving households were also significantly (p=.025) less likely to report acceptability of a scale of fifteen energy policies than were nonconserving households. The authors suggested that these results supported the case for voluntary conservation on the part of households. They further maintained that incentives rather than restrictions might promote greater conservation in the future. It was also reported that (p=.039). Higher incomes were those households reporting at least a \$15,000 annual gross income. Conservers also reported a higher level of education (p=.006). The difference, however, was slight with conservers reporting slightly more than 13.4 years and nonconservers reporting slightly less than 13 years.

Morrison, Keith, and Zuiches (1979) identified price of energy supplies as the most apparent impact of recent changes in fossil fuel availability. They reported that households from lower income, lower educational, rural, and older populations experienced greater stress from increased cost of fuels.

Of various familial characteristics, Morrison et al., found that a reduction in direct household energy consumption was significantly related only to educational level. Specifically, households where the male head had some college showed a 8.5 percent reduction whereas households in which the female head had less than a high school education reduced 10.6 percent. The authors attributed the reduction to choice and economic need, respectively.

Other familial characteristics reported by Morrison et al., showed directional yet nonsignificant differences in actual reduced consumption. The greatest reduction occurred in the middle income groups; households where the head was within the over-45 age group; white collar; and urban households. In addition, households with one to two persons and households with more than five persons showed

greater conservation than did medium sized households. Similar reductions were found based on number of rooms in the house.

The authors also reported that cost of fuel used for heating was an important factor in the reduction of energy consumption. It was reported that the greater rate of increase in the cost of the fuel used by the households, the greater the reduction in use. Fuel oil showed a 126 percent increase in cost over the period studied; natural gas an 81 percent increase. Fuel oil users reduced consumption by 11.1 percent compared to 6.6 percent by natural gas users. The cost of electricity increased by 50 percent and there was a slight increase in use as well. The authors explained this difference by noting that most household uses of electricity are for lighting and appliances rather than space heating. Thus, the impact may have been of a smaller proportion.

Morrison, Keith, and Zuiches reported that belief in the energy problem showed an unexpected influence on conservation. Households where both husband and wife did not believe there was a problem had, in fact, reduced their consumption more than households where both husbands and wives reported belief. The authors maintained that these results supported the idea that conservation tended to be based on economic reasons rather than moral perceptions of an energy problem.

Merkley (1980) conducted a secondary analysis of data collected during the evaluation of Pilot Project Conserve (see Harris, et al., 1980). When testing for the influence of age related factors on conservation, Merkley found that the level of past experience with deprivation and shortages was a significant indicator of a proportional change in energy consumption. Thus households having members with higher levels of past experience with deprivation (the depression years, world wars) were conserving more than households with less experience. Merkley concluded that two factors might account for this finding. First, she suggested that persons previously having experience with a deprivation have the knowledge and skills to cut back. Secondly she suggested that these persons may be conserving in order to forstall a crisis.

Voluntary Simplicity Participation

Voluntary simplicity has been identified as a lifestyle alternative which would involve the substitution of human energy for fossil fuel energy. Based on five values this lifestyle integrates both social and economic decision making into the definition of goals and the use of resources.

The term voluntary simplicity was originally coined in 1936 by Richard Gregg to describe a lifestyle involving a singleness of purpose; inward sincerity and honesty; and avoidance of excessive material possessions. Its background

is in religious and spiritual philosophies (Gregg, 1977). According to Gregg, voluntary simplicity requires the management of resources from a quality of life based on material goods to one based on a philosophy of life:

It means an ordering and guiding of our energy and our desires, a partial restraint in some directions in order to secure greater abundance of life in other directions. It involves a deliberate organization of life for a purpose (Gregg, 1977 p. 20).

Gregg identified some basic reasons for a life of simplicity. His first was improvement of the economic system. Gregg maintained that control over individual consumption would act as a deterrent to the greedy and competitive nature of our present system of production and distribution. Production of material luxuries requires the use of labor, capital, and raw materials which could be used toward greater social ends. Gregg noted that such production involved the exploitation of humans through price increases, lowered real wages, and excessive labor on the part of the poor to make up for economic losses. He also maintained that participation in the production of luxury items led to frequent unemployment in times of consumer fluctuations and economic depression.

In addition, Gregg suggested that material simplicity was a factor in the political greatness of men such as Lenin, Gandhi, and Buddah. The simplicity of their lives, he maintained, identified the leader with others of small material wealth. This contributed to the self-respect of persons within the society through sharing in the leader's greatness. Self-respect is the basis for a morality achieved through expression of basic values.

Elgin and Mitchell (1977) drew from Gregg to identify five basic values on which voluntary simplicity as a lifestyle is said to be based. These values include material simplicity, human scale, self-determination, ecological awareness, and personal growth. Simplification of material life is based on consumption of goods through examination of the contribution of the good in relation to the four other values. For example, when deciding on the purchase of a new item, its value would be assessed based on its contribution to self-reliance and common social good; and cooperation with rather than control of the natural environment.

It is important to note that material simplicity does not mean poverty (Gregg, 1977; Elgin and Mitchell, 1977). On the contrary, the concept of voluntary simplicity requires that basic needs be met; otherwise an environment for personal growth is missing.

Elgin and Mitchell (1977) described material simplicity from the perspective that possessions must contribute to personal growth. Human scale and selfdetermination values lead to the goal that living and working environments become human rather than institution controlled. The self-determined individual may seek material sufficiency by producing his/her own goods for

consumption. A greater connection can then be identified between work and the contribution of that work to society as a whole.

Mitchell and Elgin defined ecological awareness as an acknowledgement of the "interconnectedness and interdependence of people and resources." Also involved is the awareness of the finiteness of physical resources. Equally important, however, is the awareness and concern for those less fortunate resulting in a sense of social responsibility.

When characterizing those persons living a lifestyle of voluntary simplicity Elgin and Mitchell first noted that there are degrees of participation. Full voluntary simplicity is followed by only about three percent of the population. Partial participation involves about twice as many persons. A third group is made up of individuals who sympathize with the goals of voluntary simplicity but for one or more reasons do not participate. Finally, there is the group that is indifferent, unaware or opposed to the lifestyle.

Specific characteristics of the participants as identified by Elgin and Mitchell included well educated, white males and females from middle or upper class backgrounds. They are most likely in their twenties or thirties and predominantly single. Incomes tended to be bimodal with students making up the greatest portion of the group under \$5,000.

Leonard-Barton and Rogers (1980) designed an 18item measure of voluntary simplicity behaviors. They selected items which were most directly related to conservation and therefore intended to also relate to three of the five values significant to voluntary simplicity: material simplicity, self-determination, and ecological awareness. Several of the questions were derived from behaviors identified previously by Elgin and Mitchell.

The scale progressed through three stages to reach its most recent 18-item format. Data provided by Leonard-Barton and Rogers concerning use of the scale were based on the responses of 812 California homeowners to these 18 questions. The authors subjected the scale to factor analysis and regression analysis in order to simplify its contents for future needs.

Six factors emerged from factor analysis and were characterized by Leonard-Barton and Rogers as biking, selfsufficiency in services, recycling of resources (metals, glass), self-sufficiency through making goods, recycling of durable goods (clothing, furniture), and closeness with nature.

The scale items were also regressed on the total voluntary simplicity scores for each respondent. Once again data were based on the responses of the 812 California homeowners. Ninety percent of the variance was accounted for by nine of the scale items.

Three studies were conducted using the questionnaire at various stages of its development. In the spring of 1977, a nine question measure was administered to 215 Palo Alto, California homeowners. A three county study was conducted during the spring of 1979 using an expanded 19-item scale. Half of this sample included households with recently installed solar equipment. During the fall of 1979, the 18-item scale previously described was administered to the 812 homeowners throughout California.

Leonard-Barton and Rogers reported that the tendency toward participation in voluntary simplicity accounted for five percent of the variance in predicting conservation practices such as adding insulation or weatherstripping. The complete regression model based on the 1977 data accounted for 22 percent of the variance, thus voluntary simplicity behaviors actually contributed to onefourth of the total variance accounted for in the model. Analysis of data collected during the statewide study resulted in low but significant correlation with two variables: turning off the furnace pilot light during the summer and weatherstripping.

The authors maintained that these findings indirectly related participation in voluntary simplicity to reduced energy consumption. While no direct significant relationship was determined between voluntary simplicity behaviors and natural gas usage, the connection was made

based on the relationship of voluntary simplicity to energy conserving behaviors which in turn were considered predictive of gas usage.

Leonard-Barton and Rogers also investigated the relationship between voluntary simplicity behaviors and various demographic variables. They found the relationship between voluntary simplicity and income to be only slightly curvilinear. The income variable was trichotomized: High (\$26,000+), Medium (\$16-25,000) and Low (\$15,000 or less). Mean scores of the middle income group on voluntary simplicity was only slightly higher, 38.2, as compared to 35.9 and 35.8 for low and high income families, respectively.

Education was found to have a low yet significant correlation (r=.16; p=.001) to voluntary simplicity scores. Specific items related to education included biking, recycling paper and glass, taking classes to increase selfreliance and contribution to ecological organizations. Education and income were correlated, yet education was related to voluntary simplicity while income was not, thus the authors maintained that the data were supportive of the premise that voluntary simplicity behaviors were indeed voluntary.

A skill used to produce a good or make a repair can frequently be used as a substitute for paid services. The majority of voluntary simplicity behaviors require possession of some basic skills. Leonard-Barton and Rogers

found significant relationships between voluntary simplicity and mechanical ability.

With an underlying assumption that a large portion of the migrants to rural northern California areas would be persons participating in voluntary simplicity behaviors, Hackett and Schwartz (1980) studied 39 such individuals. Their sample was selected from five areas: three communes, two semi-isolated settlements, and one small village. Subjects in larger communities were chosen randomly. In less populated communities respondents were found through referral of other respondents.

Hackett and Schwartz reported that the alternative lifestyle participants in their sample were primarily in their late twenties or early thirties. Four were familiar with rural life; most tended to come from predominantly middle-class urban backgrounds. Overall interviews detected general themes of concern about simplicity of material goods and importance of personal relationships. Self-reliance was important but the emphasis seemed to be geared towards a cooperative self-reliance.

Income for these persons was a result primarily of part-time wage earning jobs. Some of the persons interviewed were receiving assistance from other family members or from government agencies in the form of unemployment insurance, social security disability, food stamps, or subsidized medical services.

Home production was an economically important aspect of the lifestyle. Self-sufficiency in building their own home was more important to this sample than growing food. Only ten percent of the sample produced over 60 percent of their food needs for summer. Considerable emphasis was placed on recycling. Frequently homes were built from goods salvaged. Seventy-five percent of the homes cost under \$1,000 to build. Few of these homes were insulated; most were without plumbing. Service by utilities was infrequent due to both the economic cost of installation and the philosophical premise that utility companies are supportive of nuclear power.

Within the communes, the sharing of appliances was common. This resulted in a considerably lower portion of sampled households reporting ownership of appliances when compared to ownership by low income households reported in other studies.

The researchers attempted to obtain data on household use of energy. The four major available sources of energy included propane, kerosene, gasoline, and wood. Data were based on self reports. The average yearly use of these fuels totaled 16.4 million British thermal units. When comparing this use to a nationwide sample² the authors noted that these voluntary simplicity households used approximately half the amount of energy used by poor families.

²Newman and Day (1975:90)

Human Resource Availability

Changes in an economy through a decline in wage rates, fewer work opportunities, scarcity of goods, or changed expectations of the consumer results in adjustments in consumption and production (Strumpel, 1976; Katona, 1972; Caplovitz, 1979; and Elder, 1974). Money income is one such resource. When a "shortage" of income occurs, households have been found to make attempts to raise income, save less, reduce market consumption, and increase household production.

A reduction of expenditures and attempts to generate alternate or supplementary sources of income were responses to loss of income during the depression (Elder, 1974). Possible new income sources included the entry of mother into the labor market, money from relatives or boarders, and public assistance. Reduction of expenditures involved a change to a more labor intensive household and a reassessment of consumption norms. Elder maintained that successful adaptation to impacts of the depression was dependent on other household resources including motivation and familial and environmental support systems.

Socioeconomic status and intelligence were identified as family characteristics which contributed to motivational level. Elder suggested that the socioeconomic status of a family influenced the image of self, problem solving skills, and a sense of competence. Lower class families have more firsthand experience with the lessons of

economic hardships, however, Elder maintained that middle class families provided a greater range of problem solving skills and knowledge of a greater range of alternatives. Elder further contended that motivation to act only led to frustration if skills to act were lacking by the individual or family.

Some inconsistency can be noted in the motivation of families to adapt during the depression. Income, occupation, and educational level were found to contribute to problem solving skills and recognition of alternative avenues of adaptation. These same motivators, however, frequently created greater status quo rather than cooperative efforts and reduced consumption. This phenomenon occurred most frequently in middle income families.

Caplovitz (1979) explored the coping strategies of families according to their rankings as victims of inflation and recession. An objective measure was developed by income class and perceptions concerning the ability of income to keep up with rising prices.

Caplovitz reported that over half of the 1,982 families interviewed in 1976 indicated that they were worse off financially than in previous years. Approximately ten percent reported being unemployed. Social characteristics of families most affected included the poor, the semiskilled and unskilled, the poorly educated, the blacks and Spanish speaking.

In assessing the use of coping strategies according to financial impact of inflation, Caplovitz identified five strategies: income raising, reduced expenditures, bargainhunting, greater self-reliance, and sharing with others. Income raising involved one or more family members spending additional hours employed outside the home. Various other activities included performing odd jobs (frequently not reported on income tax forms) or making investments. Families curtailed expenses by changing consumption patterns for food, entertainment, clothing, vacations, and transportation. Self-reliance was achieved by making more repairs, saving money, and discovering unknown talents. Sharing included receiving and offering help among friends.

The proportion of families participating in each strategy increased as their objective financial status decreased. When controlling for income distribution the proportion of households participating in the various strategies was negatively related to income. Income raising was an exception to this pattern. Caplovitz suggested that the ability to increase income is not a matter of choice but rather one of opportunity.

In a review of research, Strumpel (1976) pointed out factors which influenced success or failure in accommodating to economic shifts. Strumpel first noted that long term adjustment occurs slowly. Female participation in

the labor force can increase the supply of money to the family, thus at least initially eliminating the need to cut back.

Young families especially those with children required the greatest amount of consumer goods and services. Along with families in the lower socioeconomic strata they reported the least flexibility to consume fewer goods. In addition, poorer families tended to be less confident of their abilities to counteract economic crises.

Perlman and Warren (1977) noted the importance of material and nonmaterial resources in maintaining the family's capacities of integration, adaptability, and cognitive competence. Material resources were listed as housing, money, automobiles, insulation and so on. Included as nonmaterial resources were knowledge, skills, information, human energy, self-esteem, and kinship supports. Adaptability refers to the ability of families to make resource substitutions. Cognitive competence involves the information processing of decision making.

Perlman and Warren maintained that the most important function of families is to meet the needs of family members by performing a variety of tasks. To perform these tasks families must call upon both their material and nonmaterial resources. It is assumed that families vary in their pool of resources and therefore differ in the constraints and opportunities within a problem situation.

As an example, Perlman and Warren looked at the importance of income as a resource which influenced adaptation to pressures of energy shortage. The authors noted that while all income groups reported price as a motivator to reduce consumption of energy, the availability of money was an important factor in the family's flexibility within the problem.

Perlman and Warren also noted that shortage of gasoline--another material resource--resulted in considerable changes in tasks performed inside and outside the home. Numerous families reduced their use of the car and use of household appliances. Two-thirds of the families reported that if the energy crisis kept them at home it would be a positive outcome. One-third, however, reported that staying at home would increase tension.

Case and Harris (1980) studied the influence of material and nonmaterial resources on reported household conservation actions. Their model of analysis assumed that a household's effectiveness in performing various conservation actions was dependent upon the availability of a variety of resources.

Analysis of these data found meaningful breakpoints for education and income. They reported that households with high school education or less reported fewer conservation actions than those households having at least some college. Households with incomes below \$10,000 reported fewer conservation behaviors than higher income households.

They also found that household structures had interesting relationships to reported conservation action. Two adult households reported more actions than single or multiple (more than two) adult households. Percentage of children in the home showed a positive significant relationship to conservation behaviors.

In terms of household resources, Case and Harris reported that money available for energy conservation devices, home repair skills available, and two adults in the household showed strongest associations with energy conserving behaviors. Knowledge of actions had a negative relationship to actually taking the action.

Using path analysis to observe indirect effects the data showed that rural location had a positive relationship with conservation. This relationship was explained in terms of rural households being more dependent on more expensive heating fuels, having higher skills, and less knowledge of conservation actions. Education and income were found to have a contradictory association with intervening variables. Education was reported to have a positive relationship to attitudes and fuel type but a negative relationship to skills. Income was positively related to house type, skill level and knowledge but showed a negative relationship with attitudes, fuel type, and number of adults. Thus, it can be seen that households with specific characteristics positive to energy

conserving behaviors may in fact, have other characteristics which more or less constrain behavior change.

As part of the analysis of data for the evaluation of Pilot Project Conserve (1980), the researchers looked at the relationship between resources and resulting energy conservation. Resources included in the analysis were knowledge of conservation actions, accuracy of estimated savings possible through conservation, education, income, ability to afford conservation device, number of occupants, health reasons, expected difficulty in obtaining materials or installation of conservation device. The six best bivariate predictors were included in a multivariate regression analysis computed against a composite energy conservation action scale. Health, number of occupants, accuracy of estimated savings, number of suggestions, effectiveness of suggestions, and education were found to explain eight percent of the variance.

A similar analysis was done for motivational factors. Although many of the attitudinal and situational motivators were positively related to taking conservation actions, only four percent of the variance was accounted for. The model included ecoconsciousness, presence of children, belief in the energy problem, rurality, presence of married adults, percentage of household income spent on heating fuel.

The final report also included an assessment of the affect of the conservation actions on actual reduced

consumption. Addition of wall insulation was the only single measure which was significant at or below the .05 level. Using the five "best" indicators from this regression together with participation in the project accounted for four percent of the variance in the percentage change in energy consumption.

Gurin and Gurin (1976) discussed the relevancy of internal-external control to economic attitudes and behavior. The authors used the terms personal efficacy and control ideology. Both were defined as bases of expectancy referring to individual perceptions over what controlled individual goal achievement. Personal efficacy reflects the extent to which individuals perceive themselves in control. External control reflects as powerless to affect change. The authors maintained that the distinction between personal (internal) control and control ideology (external) was predictive of behavior and attitudes.

The authors performed a factor analysis of responses to a variety of questions concerning bases of expectancy, achievement, and interpersonal trust. Six factors resulted, two of which fit the described personal and control ideologies. The authors then compared the factors on several classes of variables: social and economic status; goals and values; and personal and general



economic reactions and behaviors. For purposes of this review, I will focus only on findings related to personal control.

Multiple classification was used to determine the contribution of demographic characteristics to personal control. Income contributed the most to the variance and had a beta weight of .24. Occupation, education, and race contributed in that order. The authors determined that feelings of control were related to the actual economic resources under one's control.

Gurin and Gurin assumed that a sense of personal control would result in more successful income management. They defined income management as the ability to live within one's income and manage to save a portion of that income. Findings confirmed this hypothesis. The authors reported that individuals with greater personal efficacy are less concerned about external crises and feel that their economic well-being is in a large part dependent upon their own efforts. It was also reported that those individuals with a sense of personal control were more willing to take risks to get ahead. Belief in personal control was not, however, found to be related to a sense that inflation and recession are controllable. Neither did personal control respondents want government to interfere into personal economics.

The inability of the data to show strong relationships between personal efficacy and an individual's own

personal economic situation caused the authors to question whether individuals were maintaining a general belief that they were responsible for success yet had lost a sense of control over their own lives. The authors were especially concerned as to what impact this would have.

Looking specifically at the interaction between a sense of personal efficacy and various objective factors Gurin and Gurin reported that the introduction of status indicators reduced the effect of personal efficacy in the research previously mentioned. Thus the interaction of environmental and psychological factors is considered quite important in that while objective conditions mediate the impact of psychological factors so do the psychological factors mediate the impact of objective factors.

In summary, two factors emerge from the literature on motivation towards energy conservation: income and values. Household income represents the ability of the household to purchase energy either directly for such uses as heating the home or gasoline for transportation or indirectly in the form of goods and services. If income is scarce, the household's ability to make purchases is lowered. If the price of energy becomes consistently higher and the household income does not increase proportionately, the household is less able to purchase energy at the same rate without substituting income which might be used in another way. In either case, conservation of energy may occur.

On the other hand, if the household members possess attitudes or values which recognize present patterns of energy use as inequitable or potentially harmful to society, that household may alter its behavior in order to maintain its value base. The ability of a household to act upon its motivation, however, is dependent upon the availability of resources which may be substituted for present forms of energy. This review has focused upon human resources. One such resource is human energy which can be directly substituted for fossil fuels under some circumstances. Other human resources such as knowledge, a sense of personal control, and perceptions of time and money may facilitate adaptation to a less energy intensive lifestyle.

The overall assumption made is that decisions determined by households concerned with management of resources will determine behavior patterns of households. Ideally, behavior patterns are reflective of lifestyle or value preferences. As a result, these decisions will determine the type of energy consumed and the level of consumption.

CHAPTER III

METHODOLOGY AND HYPOTHESIZED RELATIONSHIPS

The purpose of this study was to determine the influence of financial and philosophical motivators on direct and indirect conservation of energy. Direct conservation was determined through an analysis of change in actual consumption patterns. A measure of indirect conservation would necessarily involve considerable monitoring of change in household's purchases and participation in the home production of goods and services. For purposes of this research a measure of voluntary simplicity was obtained and used as an indicator of indirect conservation. In addition, the study was designed to assess the influence of various human resources on the performance of conservation behaviors.

Data used for the analysis were collected during the evaluation of "Project Conserve." Project Conserve is a computerized energy audit designed to provide individualized information to households regarding potential energy conservation.

An evaluation of Project Conserve was designed to determine the influence of conservation information

provided in the form of a computerized printout. The evaluation was conducted by a team of researchers at the Institute for Family and Child Study at Michigan State University.

The evaluation was designed to include two telephone interviews. The interviews were conducted during the spring of 1979 and the fall of 1980. The telephone interviews were limited to approximately twenty minutes. In order to ask all of the needed questions and to include data on household structural characteristics for groups not returning the audit form, an additional guestionnaire was mailed to all households which participated in the first telephone interview. Also during the first telephone interview respondents were asked if they would be willing to sign a permission form allowing the release of actual household consumption data from appropriate utility and oil companies. Data were then requested for those households, having signed the permission forms, for the period from June 1977 through June 1980. Both follow-up interviews asked questions related to attitudes, demographic characteristics, and adoption of energy conserving measures.

The 1979 telephone interview was contracted out to Neal and Associates in Ann Arbor, Michigan. The 1980 interviews were conducted by Detroit Marketing Service in Detroit, Michigan. Both companies were responsible for

providing raw data tapes. The tapes were checked by the research team for correctness.

Research Subsample Selection and Description

The primary goal of this research was to explore the relationship between various motivators and human resources on a household's pattern of direct and indirect conservation of energy. One adult from each household was considered the unit of observation. The household was selected as the unit of analysis. For a household to be included in the research subsample it was required that sufficient data be available to adequately measure direct and indirect conservation. This resulted in two primary criteria.

First, it was necessary for a household member to have completed a series of eleven questions developed to assess participation in voluntary simplicity. As noted previously, participation in such behaviors is said to be related to a less materialistically oriented philosophy and thus less consumption of energy-intensive goods and services. Data were considered adequate if no greater than 20 percent (two) questions were left unanswered. The voluntary simplicity questions were asked of respondents in 924 households. Of this group, there were no households which were unable to meet the criterion.

The second criterion for selection in the subsample was concerned with the completeness of household
energy consumption data for July 1977 through June 1978 and July 1979 through June 1980. Permission to obtain this information was requested of the total evaluation sample.³ Permission was given by 52.1 percent. Households from which no permission was granted were eliminated from the subsample. For most cases in which the consumption data were available, it was complete for both years required. In some instances, however, it was necessary to extrapolate consumption for intermittent periods which were missing. Extrapolation procedures resulted in conservative estimates of actual consumption. Complete explanation of the extrapolation procedure is given in the Final Report of Pilot Project Conserve (Harris et al., 1980).

The data base contained 638 households meeting both criteria. These households were selected as the research subsample for the analysis in this report. Basic demographic characteristics of the subsample are reported in Tables 1 and 2. For purposes of generalizability the same descriptive characteristics are provided for all households within the State of Michigan. Demographics were collected on the research subsample in 1979, data for the State of Michigan are reported for the latest date available.

In the research sample, the household member res-<u>ponding to</u> the interview questions was primarily ³Permission was actually requested for a three year period from June 1977 to July 1980. Only the first and last year were included in the analysis for this study.

middle-aged; nearly 60 percent fell between the ages of 35 and 64. Less than half the respondents had attended college. Eighty percent, however, had at least a high school education. Slightly more than half were female. When compared to the State of Michigan the research sample consisted of a similar distribution of males and females. Age and educational level appeared somewhat higher in the sample than in the population as a whole.

Ninety-seven percent of the respondents owned their homes. Sixty percent of the households were located in small to medium sized cities or towns; approximately 30 percent were located in the country and ten percent in large cities.

Households in the research subsample consisted of an average of 3.2 members. Nearly 70 percent (67.7) of the households had two adult members; one-fifth had more than two adults. Eight percent were single adult households. Children were found in 48.1 percent of the households.

Just under half of the households had one income earner. Twenty-seven percent were two income families. Nearly one-fifth had no employed members. The median household income was \$18,709.

When compared to the state population, household characteristics of the research sample were somewhat different. Home ownership was more prevalent in the research sample because the evaluation sample of the Statewide

Project Conserve overrepresented single family residences. Income level was slightly lower perhaps due to the nonresponse of reported income for nearly ten percent of the research sample. Household structure was not greatly different, yet tended to underrepresent single parent households.

Seventy percent of the households used natural gas for heating; another 19 percent used fuel oil. Electricity, wood, and propane, in that order, completed the heating fuel types used by households. The larger percentage of households within the research sample which were heated by electricity and wood when compared to heating fuels used by households throughout the State of Michigan was reflective of the shift in household heating fuels which occurred during the 1970s.

Measurement Procedures

Dependent and independent variables were developed from questions asked during the evaluation of Statewide Project Conserve. Specifically those variables used as predictors of conservation were based on data collected in 1979. Dependent measures of voluntary simplicity and personal control were each developed from questions asked during the 1980 telephone interviews. The measure of conservation was collected over a three year period from June of 1977 through June of 1980.

Respondent Characteristics	Michigan Households (in thousands)	Research Subsample
	100%	100% (N=638)
Gender of Respondent	(1976)	
Female	52.9	51.3
Male	47.1	48.7
Age of Respondent ²	(1970)	
Less than 25	8.1	3.2
25 to 34	21.6	19.6
35 to 44	18.0	17.8
44 to 64	35.2	39.2
65 and older	17.0	20.4
Missing		0.2
Education Level ³	(1970)	
Less than High School	47.2	19.7
High School	33.7	41.1
Some College	14.8	30.9
Graduate Work	4.3	8.3

Table 1. Selected Household Characteristics - Comparison of Research Subsample, 1978, and Michigan Households

lState Data Source, Andrews, M.P. and Boger, R.P. (Eds.), Michigan Family Sourcebook, Michigan State University, 1980. 2State Data Source, Verway, David I., Michigan Statistical Abstracts, 1979. Table I-16, p. 62. 3State Data Source, Verway, David I., Michigan Statistical Abstracts, 1979. Table IV-2, p. 150. (Based on adults age 25 or older.)

Household Characteristics	Michigan Housebolds	Subsample
	100% (Year)	100% (Year)
Number of Household Occupants ¹	(1970)	1000 (1011)
One Two Three or Four Five or More		8.0 33.4 38.1 20.5
Average	3.27	3.2
Home Ownership ²	(1976)	
Own Rent Missing	76.0 24.0 	97.2 2.4 0.5
Household Income Level ³	(1979)	
Under \$ 5,000 \$ 5,000 - \$ 9,999 \$10,000 - \$14,999 \$15,000 - \$19,999 \$20,000 - \$24,999 \$25,000 - \$29,999 Over \$30,000 Missing	5.7 12.3 15.0 18.8 19.0 11.9 17.3	5.8 13.5 12.2 18.2 16.9 8.3 15.2 9.9
Median	\$19,500	\$18,709
Household Structure ⁴		
Two Adults with Children Two Adults - No Children Female with Children Male with Children More than Two Adults with Children More than Two Adults - No Children Single Adult	31.4 34.5 10.9 2.2 20.9	35.3 32.4 0.6 0.8 11.4 11.4 8.0
Fuel Used for Heating ⁵	(1970)	
Natural Gas Electricity Propane Fuel Oil Wood Coal, Other	69.9 2.5 3.6 22.0 0.2 2.2	71.2 4.1 2.2 18.8 3.8

Table 2. Selected Household Characteristics. Comparison of Research Subsample, 1978, and Michigan Households.

¹State Data Source, Verway, David I. Michigan Statistical
Abstract, 1979. Table I-17, p. 63.
²State Data Source, Verway, David I. Michigan Statistical
Abstract, 1979. Table II-1, p. 81.
³U.S. Bureau of Census, Current Population Reports, 1979.
⁴State Data Source
5

⁵State Data Source, Housing Characteristics for State, Cities, and Counties, Vol. I, Part 24, Michigan 1970. Census of Housing, Bureau of Census, 1972.

Measures of Conservation

The primary objective of this research was to explore direct and indirect conservation of fossil fuel energy within households. Direct conservation of energy was measured by percentage reduction in consumption. Indirect conservation was measured based on self-reported participation in a set of behaviors defined as voluntary simplicity.

The first research question was specifically concerned with the percentage of households participating in conservation behaviors:

> 1. With what frequency are households reducing direct consumption of fossil fuel energy and with what frequency are they participating in behaviors related to voluntary simplicity?

An explanation of the development of each conservation measure is provided in this section. In addition, discussion of the analysis based on the first research question is also provided here. Analysis of the first research question was intended to be exploratory and therefore no hypotheses were tested. Frequencies, percentages, and mean scores are reported for percentage change in direct household consumption of fossil fuel energy (Table 3) and for participation in voluntary simplicity behaviors (Tables 4 and 5).

Percentage Change in Consumption. Actual consumption of energy within the household was determined by obtaining utility company records for the years 1977-78 and 1979-80. Consumption data were initially collected and coded by month. Extrapolations were computed based on heating degree days if a month was required to complete the data. The monthly consumption of each fuel was summed for each year to provide an annual consumption figure. Measures of natural gas, electricity, propane, and fuel oil were converted to British thermal units (Btus) to facilitate computations and analysis. The following conversion factors as reported by Newman and Day (1975) were used:

Natural Gas	-	1,031 Btus per cubic foot
Electricity	-	3,412.8 Btus per kilowatt hour
Fuel Oil	-	138,800 Btus per gallon
Propane	-	21,000 Btus per pound

The number of Btus of each fuel used within the household was added together to determine the total Btu consumption. This provided a precise measurement of the household's annual consumption.

Yearly fluctuations in temperature may result in varying fuel requirements used for space heating. Space heating has been identified as the largest single end use of energy within the home; therefore, it is necessary to control for changing requirements. The number of annual heating degree days was used to standardize yearly consumption figures.



The resulting figures were used to compute percentage change in annual consumption. This was accomplished by dividing the difference in consumption between 1977-78 and 1979-80 by consumption during 1977-78. This measure provided an estimate of conservation relative to previous consumption. Summary data of the percentage change in consumption are presented in Table 3.

Table 3. Percentage Change in Household Consumption 1977-78, 1979-80

Level of Change	(N)	Percentage	
Greater than 4% Reduction	232	36.4	
4% Reduction to 4% Increase	232	36.4	
Greater than 4% Increase	174	27.2	
	638	100.0	
Mean	018		

Standard Deviation .156 Standard Error .006

Findings

One-third of the research subsample (36.4 percent) had reduced their household consumption of energy more than four percent. An increase in consumption of greater than four percent was observed in 27.2 percent of the households. The remainder of households were within [±] four percent of their first year's consumption. The mean change of -.018 indicated that the average household was realizing slightly less than a two percent reduction in direct energy consumption.

Voluntary Simplicity Participation. Structured questions developed by Leonard-Barton and Rogers (1980) to assess the extent to which persons were practicing behaviors related to a philosophy of voluntary simplicity were used in this study as a dependent variable measuring household voluntary simplicity participation. The questions were based on a survey of households claiming voluntary simplicity participation which was implemented by Elgin and Mitchell.

Leonard-Barton and Rogers provided an 18-item Likert measure which they subjected to factor analysis and regression analysis in order to provide researchers with a streamlined measure. For purposes of this research 11 of the 18 questions were used. Nine questions were chosen which were shown through regression analysis to account for 90 percent of the total voluntary simplicity score variance. The remaining two variables were selected based on the results of the factor analysis conducted by Leonard-Barton and Rogers. Two factors of interest to this research were self-sufficiency in goods and selfsufficiency in services. The final two questions completed the inclusion of all variables which loaded on these factors at .3 or greater. These questions, resulting frequencies and percentages can be found in Table 4.



licity Behaviors.	
luntary Simp	
in Vo	
Participation	
ds Reporting	(N=638)
of Household	Subscales.
Percentage	Grouped by
Table 4.	

In Services	
Sufficiency	
Self-	

tercise	24.5	21.0	9.2	10.7	34.5 0.2		thing	iture	(8)	6.1	10.2	20.5	24.3	38.6	0.3
Bicycle for Ex	Everyday Several Times	per Week	Once a week	Once a month	Never Missing	in Goods	Make Clc	or Furn		Most	Many	Some	Few	Never	Missing
ervices	24.8 3.3	9.6	2.2	60.2		ficiency			(8)	8.3	5.2	21.2	39.7	24.5	1.3
Exchange Goods & Se	Whenever Possible Many Times	Several Times	Have Once	Never		Self-Suf		Make Gifts		Always	Usually	Frequently	Occasionally	Never	Missing
(8)	16.6	15.5	13.0	13.4	41.3										
Instruction in Skills	More than one class One class	Frequently from friends	Occasionally from friends	Book - Manuals	ISVAN	icy In Food		Have Compost Pile	(8)	Yes 26.2	No 73.8				
l in Family Car (8)	56.0	y 6.0	11y 6.1	28.4	*	Self-Sufficien	its	ables	(8)	13.2	13.7	9.1	33.9	30.4	0.2
Change Oi	Always Usually	Frequentl	Occasiona	Never Miccing	hureetu		Grow Fru	and Veget		All	Most	Many	Some	None	Missing

ling	Glass Jars-Bottles	41.7	8.3	9.2	12.2	28.1	0 5
Recyc	Newspapers (8)	45.0	4.4	4.7	12.4	33.4	0.2
		Always	Jsually	requently	Occasionally	Vever	Aissing

Contribute to Ecological Organizations	
	(8)
Two or More	3.8
One Only	2.8
Occasionally	4.7
Did but not now	1.4
Never Have 8	85.6
Don't Know	1.7

Responses on individual items were recoded in order that a response which indicated no participation received a score of zero; a response indicating the highest level of participation received a four. The overall voluntary simplicity index was computed by summing the recoded raw scores on individual items and dividing by the total number of questions answered. The resulting index had a range from zero to four. This final score was categorized to indicate the distribution of the sample among levels of participation. Summary data are presented in Table 5 which indicates a moderate level of participation.

Reliability of the voluntary simplicity scale was tested. Chronbach's alpha of .59 indicated a moderate level of reliability. Deletion of any item did not improve the reliability.

In addition to having a moderate level of reliability, the items chosen for inclusion in the total index were considered conceptually meaningful. For further refinement, however, the ll questions on voluntary simplicity were subjected to factor analysis. Factor analysis is a statistical technique used to examine interrelationships among variables with the objective of representing them in a smaller number of hypothetical variables (Kim and Mueller, 1978).

The measure of voluntary simplicity used in this research was determined through factor analysis⁴ to include behaviors related to self-sufficiency in services, self-sufficiency in goods, self-sufficiency in food, recycling, and contributions to ecological organizations. Factor loadings greater than .300 resulted in the inclusion of item within the factor (Table 6).

Measures for each factor were constructed by summing the scores of each variable relevant to the specific factor. Prior to summing, the raw scores were multiplied by the regression coefficient (factor loadings) in order to appropriately weight the influence of the variable to the factor score. As with the total index, the factor scores were categorized into levels of participation in order to facilitate discussion. Frequencies, percentages, and mean scores are reported for the total voluntary simplicity scale and for each of the five subscales in Table 5.

Findings. The mean score for the voluntary simplicity scale was 1.509, based on a possible range of zero to four. No respondent received the maximum score; 3.455 was the highest total voluntary simplicity score achieved. Approximately one-fifth (21.5 percent) of the respondents indicated frequent participation in voluntary

⁴Factor loadings from varimax rotation were used in computing the subscales. Oblique rotation resulted in delineation of similar factors.



simplicity behaviors by household members. The majority, 54.1 percent, reported occasional participation, indicating that a very large percentage of the households were participating in at least some voluntary simplicity behaviors-some of the time. Another 23.7 percent reported infrequent participation while less than one percent of the respondents reported that no one in their household had performed any voluntary simplicity behaviors.

An analysis of the subscales provided insight into specifically what types of behaviors were most frequently practiced. Slightly more than half of the sample reported frequent recycling. Two questions determined the scores for this category. The first asked the extent to which households recycled newspapers; the second asked the extent to which glass jars and bottles were recycled. Frequencies for both questions indicated that approximately half of the sample usually or always recycled newspapers and glass jars or bottles. Approximately 13.5 percent indicated that they never recycled.

Within the self-sufficiency in services subscale, results indicated that greater than one-third of the respondents indicated high levels of participation in producing services within the home. Less than ten percent reported that these behaviors were never performed. Over half (56 percent) of the respondents indicated that a household member always changed the oil in their car. Twenty-eight percent reported never doing this.

Mean	Scores and Ca	tegorical Pe	ercentages			
		Volur	ıtary Simp	licity Su	lbscales	
	Total	Self-Sı	ıfficiency	In		Contribution
	voimicary Simplicity	Services	Goods	Food	Recycling	to Organizations
	(N=638)	(N=638)	(N=638)	(N=638)	(N=638)	(N=638)
Level of Participation			In	Percent		
Usually or Always	21.5	38.2	18.7	31.0	52.5	6.6
Occasionally	54.1	31.0	29.6	15.2	20.8	4.7
Infrequently	23.7	21.9	34.3	25.9	12.7	1.4
Never	0.8	8.5	15.8	27.7	13.5	87.3
Missing		0.3	1.6	0.2	0.5	1

Table 5. Participation in Voluntary Simplicity Behaviors: Total Scale and Subscale

71

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Table 6. Factor Ar	alysis of Voluntary	Y Simplicity Behavio	rs	
Question	Self-Sufficiency Services	Self-Sufficiency Food	Self-Sufficiency Goods	Recycle Resources
Change oil in family car	.334			
Gotten instruction in skill	.571			
Exchange goods or services	.410			
Ride Bicycle	.325			
Grow fruits and vegetables		.713		
Compost pile		.309		
Make gifts			.554	
Make clothing			.549	
Recycle newspapers				.672
Recycle glass				.382

Table 6.

Similarly, over half the respondents reported that they or some family member had gotten some type of instruction in skills either from classes, friends or instruction manuals. Slightly less than half (45.5 percent) reported riding a bicycle at least several times per week. One-fourth of the respondents indicated frequent exchange of goods and services while 60 percent reported that they had never exchanged goods or services.

Self-sufficiency in foods was reported at a high level by only 31 percent of the sample respondents; 27.7 percent reported no participation. Self-sufficient behavior in this category involved having a compost pile and growing fruits and vegetables for household consumption. Of the research sample 26.2 percent had a compost pile and 35.5 percent grew some fruits and vegetables. Another 33.9 percent grew some fruits and vegetables; 30.5 percent grew none of the fruits and vegetables eaten by household members.

Self-sufficiency in goods was based on having made gifts, clothes, or furniture rather than having purchased them. Observation of individual questions showed that few respondents (13.5 percent) reported that their household always or usually made their own gifts. An additional 21.4 percent reported frequently making gifts while the majority of respondents (40.2 percent) reported occasional performance of this action. One-fourth of the respondents indicated that no gifts were ever made. A larger

proportion of respondents, 38.7 percent, reported that their household never made their own clothing or furniture. Forty-five percent indicated that they made some or at least a few small items. Another 16.3 percent reported having made many or most of their clothing or furniture. Observation of the total subscale indicated that the majority of households produced few of their own goods.

A very small percentage of respondents indicated contribution to ecological organizations. Less than seven percent were actually contributing at the time surveyed. Another 6.1 percent gave occassionally or had previously done so. The majority, 87.3 percent, had never contributed to an ecological organization.

Measures of Motivation

Income Adequacy is conceptually defined in this research as the comparative ability of a household to make direct and indirect purchases of energy. The proportion of income required for lower income households to make energy purchases is greater than for families with higher incomes. As the market value of energy increases it would follow that lower income households would sense a greater stressor and possibly greater motivation to conserve.

The use of income levels when explaining consumption change is valuable, yet, does not take into consideration the income needs of the household as determined by

family size, family life cycle stage, or geographical cost of living differences. The income measure used in this research took into account the previously mentioned needs to compute an objective adequacy ratio following the examples of Ackerman (1977) and Moen (1980).

The questions concerned with income adequacy were asked during the first telephone interview conducted in June of 1979. The income adequacy variable was computed following the example of Ackerman (1977). The following information reported here is from Ackerman, pp. 51-53.

- Each respondent was assigned a Bureau of Labor Statistics equivalency number which adjusted for a moderate level of living for different family composition. Variables used include: age of oldest child, number of children in household, number of adults in household, and age of primary income earner.
- Each respondent was assigned a BLS number which adjusts the BLS standard budget for a moderate level of living for different geographic location.
- The family income variable was recoded to dollar amounts.
- 4. The objective measure was computed via the following measure:

Objective					Total Family Inco	me
Adequacy	=	Standard	Budget	x	Family Composition x	Geographic Location
Ratio		Moderate	Level		Equivalency Number "	Equivalency Number
					100	100

Summary data of the income adequacy variable are presented in Table 7. Data indicated that the sample was relatively well distributed among adequacy levels.

Household income level has been positively related to levels of direct and indirect consumption of energy. This relationship has been explained through the discussion of lifestyle decisions (Morrison and Gladhart, 1976; Gladhart, 1977). Therefore, higher income households, due to initially higher levels of consumption, could have the greatest flexibility for potential conservation. Lower

Level of Adequacy	(N)	Percentage
Very Low	92	14.4
Low	118	18.5
Medium	261	40.9
High	90	14.1
(Missing)	77	_12.1
	638	100.0

Table 7	7.	Household	Income	Adequacy	Levels,	1979
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Mean	1.320	
Standard Deviation	.718	
Standard Error	.030	
Actual Minimum - Maximum	.122 to	3.895

income households would experience the greater stress from the increased prices of fossil fuel energy sources. It was hypothesized that they would be forced economically to reduce consumption in order to reduce their fuel bill.

Based on research concerned with the relationship between income level and conservation and the research concerned with how families handle limited economic resources (Caplovitz, 1972; Elder, 1974) the following hypotheses were established:

Hypothesis 1A

Level of income adequacy will have a curvilinear relationship with the percentage change in direct household consumption of fossil fuels. Specifically households with low and high levels of income adequacy will reduce consumption more than households in middle levels of income adequacy.

Hypothesis 1B

Level of income adequacy will be negatively related to participation in behaviors related to voluntary simplicity.

<u>Fuel Cost</u>. Two additional variables were included in the regression analysis of percentage change in consumption. Fuels used for heating vary according to their absolute cost and according to the individual increase in the cost of each fuel type. It was determined that the cost of various fuel types and the relative increase in cost should be viewed as additional determinants of a household's income adequacy.

Case and Harris (1980) regressed a conservation action score onto fuel type ordered by cost and found a significant bivariate relationship. Using path analysis they determined that rural households, using more expensive fuels, tended to perform more conservation actions than urban counterparts.

Fuel cost increases were used to determine the relative shift in prices between fuel types. Based on data provided by Keith (1981) fuel oil was given the highest rating, natural gas and propane second with electricity experiencing the least increase.

These variables were included only in the regression analysis of percent change in conservation. Both variables were hypothesized to have a positive relationship with reduced consumption.

Hypothesis 2A

Relative fuel cost and relative change in fuel cost will each be positively related to reduction in direct household consumption of fossil fuels.

Philosophical Perspective. Philosophical perspective represents aspects of the symbolic value of energy within society. Questions designed to elicit the respondent's philosophy towards energy were asked during the November 1980 telephone interview. Six questions were selected from among a variety of attitudinal questions previously used in surveys conducted by the Family Energy Project at Michigan State University. The selected questions have been previously defined as representative of ecoconsciousness values. Each question was answered on a scale of strongly agree to strongly disagree (Appendix A). Answers were coded so that the responses receiving the highest code were those indicating the strongest ecoconsciousness value. An index was formed by summing the raw score for the responses to all questions for each respondent. This number was then divided by the total number of questions answered. A scale score was computed for all households which responded to at least four of the six questions. A total of 15 households (2.4 percent) did not meet this criterion.

Chronbach's alpha reliability was computed for the scale. All six questions resulted in a reliability coeficient of .74349. Deletion of any item did not improve the alpha.

The continuous score was categorized into levels which indicated agreement or disagreement with a strong ecoconsciousness value. Mean score and category frequencies are reported in Table 8.



/			
Household Level	(N)	Percentage	
Strong Agreement	289	45.3	
Agreement	324	50.8	
Disagreement	9	1.4	
Strong Disagreement	1	0.2	
Missing	15	2.4	
Mean 2.0 Standard Deviation .4 Standard Error .0	8 67 19		

Table 8. Household Scores on a Measure of Philosophical Energy Perspective, 1979

An ecoconsciousness value has been reported to have a positive relationship with taking actions related to technical and behavioral conservation (Hogan, 1976) and also with direct reduction of energy consumption within the household (Hungerford, 1978). The theoretical conceptualization of a lifestyle of voluntary material simplicity is also based on a value system which supports a positive interaction between humans and environmental awareness (Leonard-Barton and Rogers, 1980; Gregg, 1977; Elgin and Mitchell, 1977). The following hypotheses were established:

Hypothesis 3A

Level of philosophical perspective will be positively related to a reduction in household energy consumption.

Hypothesis 3B

Level of philosophical perspective will be positively related to participation in behaviors related to voluntary simplicity.

Indicators of Human Resources

Individuals and households have a variety of resources which are used to achieve goals. These resources may be tangible or intangible; human or nonhuman. One purpose of this research was to assess the influence of human resources on behaviors related to the conservation of fossil fuels. Nine human resources were identified from the list of research variables; eight are entered into the analysis as independent variables, one as a dependent variable.

Explanation of the development of each human resource variable is included in this section. A summary of hypotheses regarding expected relationships of individual variables to percent change in household energy consumption and participation in voluntary simplicity behaviors is also included. Mean scores and standard deviations for human resource measures which served as independent variables are provided in Table 10. Summary data for the human resource, personal control, are presented in Table 11.

Knowledge of Conservation Actions was used as a measure of the extent to which respondents could identify efficient methods of direct conservation of fossil fuel energy. Respondents were asked the following questions in the June 1979 interview:



Let's talk about one area in which living costs can be reduced--ELECTRICITY AND HOME HEATING-and let's think about ways these costs can be reduced without giving up basic comforts.

Think of a friend who might ask you for advice on how to save on electricity and heating fuel bills.

What are the most important things you would advise your friend to do?

Respondents could mention up to six suggestions. A knowledge score was created. The respondent was given two points for suggesting attic insulation, wall insulation, basement or crawl space insulation, storm windows or doors, thermopane windows, caulking or weatherstripping, flue restrictor, clock thermostat, lowering thermostat, closing off rooms, or solar heating. One point was received for each other suggestion including hot water heater insulation, covering windows with plastic, installing a fireplace cover, servicing heating system, and turning off pilot light during summer. The knowledge scale was created by dividing the total score by the number of responses; if no suggestions were offered a score of zero was assigned. Thus the conservation knowledge scale has a minimum of zero and a maximum of two.

Promotional campaigns have frequently been based on providing information to consumers regarding conservation practices and their benefits. Data have suggested that information on how to save energy is relatively ineffective if given alone (Gordon, 1980). Knowledge of conservation methods was not found predictive of actually taking conservation actions (Case and Harris, 1980). Knowledge was not found predictive of conservation as reported in the final report of Pilot Project Conserve (Harris, et al., 1980). In the last two studies neither bivariate nor multivariate analysis proved significant. For purposes of this research it was hypothesized that if motivation were accounted for, knowledge would be positively related to reduced household consumption of energy and participation in voluntary simplicity behaviors.

Average Household Education was used as a measure of the educational attainment of the principal adult(s) within the household. When there were two adults in the household the average level of schooling was computed. If only one adult was present in the household, the level of education for that adult was used for the educational measure.

Higher levels of education are frequently associated with higher levels of income adequacy. Case and Harris (1980) determined that education had a positive relationship with ecoconsciousness and therefore with a greater likelihood of performing conservation actions. The negative relationship of education with skills, however, resulted in a contradictory relationship. Multivariate analysis of resources included education in a predictive model which accounted for eight percent of the variance in reduced consumption (Harris, et al., 1980).

Elgin and Mitchell (1977) determined that participants of voluntary simplicity behaviors were well educated. Leonard-Barton and Rogers found a low yet significant correlation of education with voluntary simplicity scores. For purposes of this research it was hypothesized that when motivation was accounted for, education would have a positive relationship with reduced household consumption of energy and participation in voluntary simplicity behaviors.

<u>Reported Home Repair Skills</u> was created to measure the extent to which household members appear capable to perform a variety of household repairs. The following questions were asked in the June 1979 telephone interview:

Now I would like you to suppose that you needed to have some repair or remodeling work done on your present home.

Which of the following tasks would you or a member of your household feel confident to do?

ASSUME THAT YOU HAVE THE TIME AND THE MONEY TO DO THESE THINGS.

- How about putting together the frame of a wall with 2 x 4s?
- 2. Put in or replace sewer and water pipes?
- 3. Replace a toilet or sink for an existing plumbing system?
- Put up or replace dry wall on a frame of 2 x 4s?
- 5. Install or replace an electric light fixture?
- 6. Install a new storm door?
- 7. Put insulation in the attic?
- 8. Do you think that you or a member of your household could cut open a wall to repair the plumbing, electrical work, or heating ducts, and return the wall back to its original condition?

Each variable was treated as dichotomous; any response other than "yes" was treated as "no." The number of responses "yes" were summed and made into a nine-point interval scale with zero indicating no skills.

Possession of skills was found an important predictor of taking conservation actions (Case and Harris, 1980). Home production of goods and services also requires a variety of skills. Elder (1972) found that households with a variety of skills were better able to cope with effects of the depression. For purposes of this research it was hypothesized that number of skills would be positively related to both direct and indirect conservation.

Perceived Money Availability was determined a subjective indicator of income adequacy. In other words, this variable was used as an indicator of how the household perceived their money resources. The scale ranged from less than fifty dollars to over \$2000 and was created from the following series of questions.

Let's talk about some things that you might do in the future.

As you know, most of the things that can be done to conserve energy--and to reduce your monthly bills--require some kind of investment at first.

It takes a while before you can get your money back, and some people can afford these investments and others cannot.

If an energy conservation device were developed which would help you save a lot of energy, would you be able to buy such a device if its total cost were: 1. \$ 50 2. \$ 200 3. \$ 500 4. \$1000 5. \$2000

Again each variable was treated as dichotomous; any response other than "yes" was treated as "no." The number of positive responses was summed and treated as a six point interval scale with zero indicating no available financial resources. Perception of the amount of available money was hypothesized to have a positive relationship with direct conservation and a negative relationship with indirect conservation.

<u>Perceived Time Availability</u> was considered an indicator of the amount of time respondents felt they had to install an energy conservation device. The scale ranged from less than five hours to fifty hours and was created from the following series of questions:

> If such a device were easy to install and not expensive, would you or someone in your household have the time to install such a device if it took:

- 5 hours to install
 10 hours?
 20 hours?
- 4. 50 hours?

Each item was treated as dichotomous; any response other than "yes" was treated as "no." The number of positive responses was summed and treated as a five point interval scale with zero indicating no available time resource. It was hypothesized that a perception of greater time

availability would be positively related to participation in direct and indirect conservation of fossil fuel energy.

<u>Number of Household Occupants</u> was viewed as a measure of the availability of human energy resources within the household. The measure was actually constructed from the perspective of the number of adults and number of children separately.

Case and Harris (1980) found that households with two adults tended to take more conservation measures than did households with one, or more than two adults. Number of children was found to have a significant positive bivariate relationship with taking conservation actions. When other variables were accounted for, however, number of children was dropped from the prediction model.

The availability of human energy within the household was hypothesized to increase the practice of voluntary simplicity behaviors. The greater the number of adults the greater the amount of human energy available. When children are present within a household it was determined that more time would be spent in providing goods and services within the home.

Based on the concept of resources, the number of adults within the household was also viewed as the availability of labor to perform conservation actions related to direct consumption, therefore, number of adults was hypothesized to have a positive relationship with direct

conservation of energy. In a study of energy consumed during life cycle stages, Fritzsche (1981) indicated that households in which children were present tended to require more energy and thus had less flexibility for conservation. Number of children within the household was hypothesized to have a negative relationship with percentage change in consumption.

<u>Number of Employed Adults</u> was a measure of human resource indicating the ability of a household to increase the availability of income. The measure was created by counting the number of household income earners among the two primary adults within the household.

Eichenberger (1975) found that dual employed households tended to use their household appliances less. Having fewer people within the household during the daytime tended to result in less direct consumption of energy within the household. Case and Harris (1980) did not find a significant relationship between number employed and taking conservation actions.

Dual employed households would be expected to have higher incomes and thus greater ability to purchase goods and services outside the household. In addition, they would be expected to perceive having less time to perform production within the home.

Dual employed households were hypothesized to have a positive relationship with direct conservation of fossil
fuel energy. They were also hypothesized to have a negative relationship with participation in voluntary simplicity behaviors.

Summary of Human Resource Hypotheses

- 4A. When all motivators, human resources, and contextual variables are accounted for, a positive relationship will exist between percentage reduction in consumption and the following human resources:
 - l) Knowledge
 - 2) Average Household Education
 - 3) Reported Skills
 - 4) Perceived Money Availability
 - 5) Perceived Time Availability
 - 6) Number of Adults
 - 7) Number of Employed Adults

and a negative relationship will exist between percentage reduction in consumption and the following human resource:

- 8) Number of Children
- 4B. When all motivators, human resources, and contextual variables are accounted for, a positive relationship will exist between voluntary simplicity scores and the following human resources:
 - 1) Knowledge
 - 2) Average Household Education
 - 3) Reported Skills
 - 4) Perceived Time Availability
 - 5) Number of Adults
 - 6) Number of Children;

and a negative relationship will exist between voluntary simplicity scores and the following human resources:

- 7) Perceived Money Availability
- 8) Number of Employed Adults

- 5A. When all motivators and human resources are accounted for the following contextual variables: age, home ownership, and rurality should provide no further contribution to the variance in percentage change in consumption.
- 5B. When all motivators and human resources are accounted for the following contextual variables: age, home ownership, and rurality should provide no further contribution to the variance in voluntary simplicity participation.

<u>Personal Control</u> was computed from a series of questions asked in November of 1980. Due to the difference in time of data collection for the measure of personal control and the other human resources, this indicator was used in the analysis as a dependent variable to measure the impact of participation in direct and indirect conservation on the development of human resources.

A sense of personal control has been related to competence and achievement especially in education and career. Gurin and Gurin (1976) have also discussed the relevancy of perceived personal control and economic behavior.

For the research reported here, personal control was defined as a psychological human resource. Five Likert-type statements were taken from the internal control scale and adapted to specify energy problems as the emphasis of the control.



Human Resource	Mean Score	Standard Deviation	(N)
Knowledge	1.536	.332	607
Number of Adults	2.221	.758	638
Number of Children	0.980	1.211	638
Reported Skills	5.340	2.138	638
Average Household Education	12.970	2.066	638

Perceived Money Number of Availability Employed Adults Perceived Time (8) Hours (8) (%) LT \$ 50 10.3 13.6 10.3 LT 5 None 50 \$ 27.4 5 12.1 47.3 One \$ 200 22.9 10 17.2 27.4 Two or More Missing \$ 500 15.7 20 16.3 6.0 \$1000 11.4 50 40.8 \$2000 12.2

Table 9. Summary Data of Human Resource Variables.

Each question was answered strongly disagree, disagree, agree or strongly agree. Answers were coded so that those indicating highest control were given a score of three; those indicating the lowest control were given a score of zero. A total score was computed by summing the raw score of each variable and dividing by the total number of statements answered. This continuous variable was categorized according to agreement levels. Summary data are provided in Table 10.

Personal control was used as a dependent variable. It was hypothesized that participation in direct and indirect conservation would increase the sense of personal control.

Statistical Analysis

One goal of this research was to explore the extent to which households had been participating in direct and indirect conservation of energy. In addition it was proposed to assess the relationship of motivation and availability of human resources to active conservation behaviors.

Direct conservation was measured through a comparison of actual consumption of energy within the household as determined from records provided by utility companies. Indirect conservation was measured by

Table 10. Personal Control, 1980.

	Percent	<u>N</u>
Strongly Agree	29.8	190
Agree	69.4	443
Disagree	0.5	5
Strongly Disagree	0.0	0
Missing	0.3	2

Mean:	2.02
Standard Deviation:	.3425
Minimum - Maximum:	0 to 3

developing an index from responses to eleven questions concerned with the extent to which households practiced behaviors related to a lifestyle defined as voluntary simplicity.

To address the first question, measures of direct and indirect conservation were categorized according to levels of participation. Mean scores, absolute frequencies, and relative frequencies were provided for comparison. In addition, the total voluntary simplicity score was factor analyzed in order to delineate underlying dimensions. Descriptive statistics were also provided for each voluntary simplicity subscale.

Multiple regression was selected for analysis of relationships between direct and indirect conservation and motivation and human resource availability. Multiple regression provided examination of two issues relevant to the research problem.



First, the procedure provided a predictive model developed from the collective contribution of motivation and human resources to the variance in both direct and indirect conservation. Use of regression with hierarchial inclusion of independent variables in the equation facilitated the development of the predictive model based on a previously defined conceptual model.

Secondly, multiple regression analysis allowed examination of the interrelationship of variables. Specifically, this procedure facilitated an examination of the impact of human resource availability on the motivation variables through ovservation of the standardized beta coefficients.

Finally, path analysis was selected as a final test of the analytical model. This procedure facilitated examination of differing relationships between motivation and human resources and each conservation mode. The final model allowed for a greater grasp of the whole picture.

Assumptions

 Survey research is an appropriate means for gaining information regarding social and behavioral dimensions of conservation.

2. Self-report data is a reliable measure of actual behavior.

3. A lifestyle of voluntary simplicity is, in fact, a less energy (fossil-fuel) intensive lifestyle.

Limitations

This study was a secondary analysis of data collected for an evaluation of a household energy-audit project. Data, therefore, were not collected solely for the goals and objectives of this research. However, exclusion or omission of variables potentially related to motivation and human resources were reviewed and were not considered a serious problem in testing the theoretical model.

The generalizability of findings is limited based on any biases of the sampled community. The goals of the research team in the evaluation of the energy audit resulted in overrepresentation of households living in single family dwellings and owning their own homes. Households living in multiple unit dwellings and renting were underrepresented.

A major limitation of this study was the selection of only one household member to be interviewed, the underlying assumption being that the responses of one member would be representative of the entire household. Previous research, however, has indicated that agreement of husbands and wives on various demographics and attitudinal survey questions cannot be relied upon (Ballweg, 1969; Byrne and Blaylock, 1963; Safilios-Rothschild, 1968; Van Es and Shingi, 1972).

Ballweg (1969) distinguished between nonevaluative, or hard data, and evaluative or soft data. Specifically, he studied the responses of 179 couples to two questions-one considered hard data and one soft data. As expected,

considerable differences were found between couple consensus. The question dealing with family income was viewed as hard data and was found to have husband and wife consensus greater than 60 percent of the time. The soft data question was concerned with which parent had the final say in child discipline. Only 23 percent of the couples were in agreement in their responses to this question.

Fairly high levels of husband and wife consensus on income was observed by Terber (1955) and also by Haberman and Elinson (1967). Byrne and Blaylock (1963) concluded from a study of 36 married couples that similarity in political attitudes and in more general attitudes was similar among couples. They also found, however, that couples assumed greater consensus than actually existed. The 36 couples included in this study were college students or professionals, thus the findings may be restricted to a relatively well educated population.

Van Es and Shingi (1972) studied the consensus of 324 husbands and wives on twenty-five attitude questions. They concluded that where attitudes are concerned it should not be assumed that either the husband or the wife can represent the whole family. They noted, however, that when the attitude is somewhat culturally determined more consensus occurs among husbands and wives.

Safilios-Rothschild studied 160 families from Detroit and 250 Athenian couples. The Detroit sample consisted of data from both the husband and wife, whereas



the Greek data included responses from 133 wives and 117 husbands. A comparison of Detroit husbands' and wives' responses about decision making showed that less than half of the couples agreed or slightly disagreed on their responses. This meant that actual serious disagreement was found in 55.1 percent of the cases. The Greek data did not permit matching. Results, however, indicated that significant differences did result even between the aggregate samples of husbands and wives.

Van Es and Shingi (1974) looked at aggregate responses of husbands and wives. Significant differences between the mean scores of husbands and wives were found on eight of the twenty-five attitudinal questions. Subsamples based on husband's occupation, husband's education and wife's education were unable to provide evidence that more homogenous groups improved the consensus. Thus it was concluded that distribution of scores for males and females could not be considered similar.

Congruence of husbands' and wives' energy attitudes was studied by Gladhart (1977) on four energy attitude scales: ecosystem awareness, human responsibility, lifestyle flexibility, and ease of cutting back. Correlations were found in the moderate range for each scale. Hungerford (1978) looked at the relationship of a husband's and a wife's ecoconsciousness value and actual change in consumption from 1974 to 1976. Congruency was not found as a significant aspect of change. Rather the greatest

reduction in consumption was found in household where the wife had high commitment and the husband had a medium commitment to values of ecoconsciousness.

The data of the present research is subject to the limitation of one household respondent interviewed. Some of the data such as change in consumption, fuel cost, fuel cost shift and income adequacy are considered hard data and therefore can be assumed to be more representative of the household. The remaining data have at least some aspects of soft data as a result of self-report and are, therefore, subject to the perceptions of the respondent. Voluntary simplicity behaviors, since they involved actual activity were viewed as somewhat more generalizable than philosophical perspectives or sense of control. The reader is advised to view the findings with these limitations.

CHAPTER IV

FINDINGS AND DISCUSSION

This research study was designed to explore the extent to which households had participated in direct and indirect conservation of fossil fuel energy and to further analyze the motivations and human resources which influence conservation behaviors. Several behaviors cumulatively defined as voluntary simplicity were chosen as the measure of indirect conservation. Percentage change in actual household consumption of energy was chosen as the measure of direct conservation.

Findings related to the first research question were reported in detail in Chapter III and will be summarized in this section. Findings related to the remaining three research questions are reported in this chapter. Each research question is addressed with the analysis of direct conservation discussed first followed by the analysis of voluntary simplicity behaviors. The primary statistical procedure employed to test the hypotheses was multiple regression analysis.



Participation in Direct and Indirect Conservation

The first research question was concerned with the percentage of households participating in conservation behaviors. Approximately one-third of the sampled households had reduced their consumption of fossil fuel energy, used primarily for space heating, by more than four percent during the 1979-80 heating season as compared to the 1977-1978 heating season.

Sampled households answered a series of 11 questions designed to measure the extent to which households have participated in lifestyle behaviors focused on selfsufficiency, recycling, and contribution to ecological organizations. Approximately three-fourths of the households had at least occasionally practiced some of the behaviors. Approximately one-fifth of the households reported active participation. As indicated by Table 11 households which reported active participation in voluntary simplicity are not necessarily the same households which reduced their direct consumption of fossil fuels.

The Effect of Motivators and Human Resources on Direct and Indirect Conservation of Fossil Fuel Energy

The second and third research questions were specifically concerned with the impact of motivators and specific human resources on change in consumption and participation in voluntary simplicity behaviors.



Reduced Household Energy Consumption	ム・ム ダ・C ダン・O アン・O Voluntary Sample Participants	なったいで、 アンドロン・ Lion Levels そうらの Percent Percent Percent Active Frequent Occasional Never	Conserving 8.0 20.1 7.8 0.5 Y Four 8.0 20.1 7.8 0.5 or More 1.53 (N=51) (N=128) (N=50) (N=3)	With No ant Change 6.9 20.0 9.2 0.2 Y Consumption 1.48 (N=44) (N=128) (N=59) (N=1)	Increasing onsumption Percent or 1.52 (N=42) (N=89) (N=42) (N=1) (N=1)	N=638
Reduced H		Conservation Level	Households Conservin Energy by Four Percent or More	Households With No Significant Change in Energy Consumpt.	Households Increasin Energy Consumption by Four Percent or More	

Comparison of Participation in Voluntary Simplicity Behaviors and Table 11.



Regression analysis was the primary statistical procedure employed to test the hypotheses related to these research questions. Bivariate regression analysis provided an indication of the total effect of each motivator and human resource on direct and indirect conservation of energy. Multiple regression analysis provided an indication of the effect of the predictors when other characteristics were taken into account.

Regression analysis provided various criteria used to assess the value of motivators and human resources. Among those used for discussion in this analysis were the standardized regression coefficient, the R square, the partial correlation, the F value and the probability. An explanation of these statistics is provided here.

The standardized regression coefficient, more commonly referred to as beta or beta weight, was used to indicate the relative importance of independent variables in explaining the dependent variable. The beta is often described as the direct effect of a predictor on a dependent variable. In a bivariate analysis the beta would be considered the total effect of one variable on another. Since no other predictors are accounted for, bivariate analysis provided betas which were zero order relationships. Multiple regression analysis provided beta weights which were based on the direct effect of the independent variable when the effects of one or more select variables were taken into account.

The R-square provided an assessment of the goodness of fit of the regression model. It indicated the proportion of variation in the dependent variable which was explained by the total of independent variables. Two statistics related to R^2 which were also used in the analysis included R^2 change and adjusted R^2 . R^2 change is a measure of the additional amount of variance accounted for by inclusion of another predictor variable. Adjusted R^2 does not increase with the addition of each new predictor variable as does R^2 but is sensitive to the effects of a larger number of predictors. When the adjusted R^2 shows a decrease it is an indication that the predictor model would lose its goodness of fit if applied to a new set of data (Hull and Nie, 1981).

The partial correlation is the correlation of two sets of residuals determined by removing the effect of other predictors first from the dependent variable and then from the predictor itself. When squared, the partial correlation can be used to approximate contribution to variance in the dependent variable which was not previously accounted for by predictor variables already in the regression equation. By observation of the partial correlation it was possible to determine relationships among the predictors.

The F-Value provided a score which indicated the ratio of explained variance to unexplained variance. The greater the explained variance the obvious reduction in

unexplained variance resulting in a ratio with a larger numerator and a smaller denominator thus a larger F-value. This value is associated with the probability that the predicted difference will not be a chance occurrence. For this study the significance level was set at .10 indicating a willingness to be incorrect in predictions only ten percent of the time.

Percentage Change in Consumption

In this section two research questions are addressed and the following hypothesized relationships were examined:

Research Question 2.

To what extent are indicators of income adequacy and philosophical perspective towards the energy issue related to a family's household reduction in direct energy consumption?

Hypothesis 1A

There will be curvilinear relationship between income adequacy and percentage change in direct household consumption of fossil fuels. Lower and higher levels of income adequacy will result in greater reduction of consumption.

Hypothesis 2A

Relative fuel cost and relative change in fuel price each have a positive linear relationship with a reduction in direct household consumption of fossil fuels.

Hypothesis 3A

Philosophical perspective is positively related to a reduction in household energy consumption.

Research Question 3.

To what extent is the availability of human

resources related to a household's reduction

in direct energy consumption?

Hypothesis 4A

A positive linear relationship exists between percentage reduction in consumption and the following human resources:

- 1) Knowledge
- 2) Average Household Education
- 3) Reported Skills
- 4) Perceived Money Availability
- 5) Perceived Time Availability
- 6) Number of Adults
- 7) Number of Employed Adults

and a negative linear relationship exists between percentage reduction in consumption and the following human resource:

8) Number of Children

Hypothesis 5A

When all motivators and human resources are accounted for, the following contextual variables -age, home ownership, and rurality--should provide no further contribution to the variance in percentage change in consumption.

Percentage change in energy consumption was regressed separately on each motivator, each human resource and each contextual measure in order to determine bivariate relationships. This procedure facilitated clarification of the individual relationships between predictors and percentage change in consumption and, thus, provided a base for higher order analysis. Summary data of the bivariate relationships are presented in Table 12.



Multiple regression analysis was used to test the hypotheses concerned with the interrelationships of the motivators, the eight human resources, and the three contextual variables in explaining variation in change in consumption. Summary data of the multiple regression analysis are presented in Table 13.

Bivariate Regression Analysis-Percentage Change in Consumption

A reduction in consumption was indicated by a negative percentage change while a positive score indicated an increase in consumption. Based on the negative scoring of the dependent variable a negative regression coefficient indicated a positive relationship of the independent variable with percentage reduction in consumption.

Findings of the Bivariate Analysis. Results of the bivariate regression analysis for percentage change in household consumption scores are presented in Table 12. None of the human resources was significantly related to a percentage reduction in consumption. One motivation and three contextual variables, however, were significant contributors.

<u>Motivators</u>. Relative fuel cost had a significant relationship with a reduction in consumption indicating that higher cost fuels resulted in some conservation of



Dependent Variable Independent Measur	and Motivators, es	Human Resour	ces and Demo	ographics as
Independent Variables	Standardized Regression Coefficients	R Square	F to Enter	Significance
Motivators				
Relative Fuel Cost Fuel Price Shift	096 053	.009	5.85 1.75	.016 .187
Philosophical Perspective Income Adequacy	034 000	.000	.744	.389 .998
Human Resources				
Knowledge	.044	.002	1.198	.274
Number of Adults	026	.001	.434	.510
Time Availability	024	.001	.351	.553
Ability to Afford Device	022	.000	.295	.587
Reported Skills	.021	.000	.282	.595
Average Household Education	013	.000	.104	.747
Number of Children	010	.000	.060	.807
Number Employed	.002	.000	.003	.960
Contextual Variables				
Home Ownership	078	.006	3.855	.050
Age	071	.005	3.194	.074
Rurality	067	.005	2.876	060.

,

Bivariate Regression Analysis with Percentage Change in Consumption as the Table 12.



energy. The amount of variance accounted for, however, was less than one percent. Differences in the price increases between fuel types did not contribute significantly to conservation. Neither income adequacy nor philosophical perspective had a significant effect on direct fossil fuel conservation.

<u>Human Resources</u>. Only three of the human resources contributed to the variance in percentage change in consumption. Their contribution, however, was negligible. None of the resources was significantly related to direct conservation.

<u>Contextual Variables</u>. Three contextual variables were included in the analysis. Home ownership, age, and rurality each had significant relationships with percentage change in consumption. Each accounted for less than one percent of the variance.

Multiple Regression Analysis-Percentage Change in Consumption

Multiple regression analysis was the statistical tool used to test the hypotheses. The format of the regression model involved the assignment of specific inclusion levels to each independent variable. Motivators were given the highest priority, human resources were second and contextual variables were given the lowest priority for inclusion. This design facilitated explanation of the additional contribution of human resources to a reduction

in household energy consumption. In addition, the inclusion of contextual variables at the lowest priority showed the extent to which the motivators and human resources included for analysis were unable to explain away contribution or rurality, age, and home ownership. Summary data are reported in Table 13.

<u>Findings</u>. With all variables accounted for only relative fuel cost and age of respondent maintained their significance. Age actually increased the amount of variance accounted for in the zero order relationship from less than one percent to 1.1 percent in the multivariate model. The total regression model accounted for only 3.3 percent of the variance in percentage change in energy consumption. The equation had a probability of .150 and therefore did not meet significance requirements.

The R square is used to indicate the incremental increase in the amount of variance accounted for by the regression equation. According to Hull and Nie (1981) a decrease in the adjusted R square is an indication of when inclusion of additional variables into the model results in a less generalizable model. The more generalizable model can then be determined through observation of any decrease in the adjusted R^2 . This decrease occurred on the third step of the regression analysis. The resulting model is identified in Table 13.



Hierarchial Multiple Regression Analysis with Percentage Change in Consumption as the Dependent Variable Table 13.

 $^{\mathrm{l}}$ Figures in parentheses correspond to statistics relevant to the chosen

A complete predictive model prediction model. 2 Adjusted R² values increased with the addition of the age variable indicating its importance in predicting direct conservation behavior. A complete predictive mode would include this variable.



Three of the four motivators were included in this model which contributed to 1.3 percent of the variance and was significant at a probability of .045. Relative cost of fuel, price shift, and philosophical perspective had beta weights of -0.76, -.052, and -0.26 respectively. Negative coefficients were expected due to the negative value of the reduction measure. Income adequacy did not contribute significantly to the model.

An attempt was made to discover whether the nonsignificant contribution of income was caused by a curvilinear relationship between the variables. One way analysis of variance was computed for percentage change in consumption by income adequacy categories. No significant difference was found between groups. However, the relationship between income adequacy and conservation was curvilinear in the expected direction. To determine if there were possible interaction effects, "breakdowns" were computed for a selected set of independent variables.

The first interaction observed was that between percentage change in consumption and income adequacy and philosophical perspective. As can be seen in Table 14 the greatest conservation was found in households with high income adequacy where the respondent indicated a low energy philosophical perspective. Mean scores indicated that low and medium income groups conserved an average of 2.7 percent whereas very low and high income groups conserved under one percent (Table 14).

Adequacy		Philosophical Perspective				
	Low	Medium	High	Mean	<u>N</u>	
Very Low		-0.9	0.9	0.02	92	
Low		-2.7	-2.9	2.63	118	
Medium	-0.7	-1.3	-3.7	2.76	261	
High	-6.0	-1.3	-0.5	0.88	90	
Mean						

Table 14. Percentage Reduced Consumption by Philosophical Perspective by Income Adequacy

Households with medium scores on philosophical perspective conserved an average of 2.7 percent if their income adequacy was low and conserved approximately 1.3 percent if they fell within the medium income adequacy groups. Households which indicated high philosophical perspective scores tended to have greater reduction in consumption due to mean reduction scores of 2.9 percent in the low income adequacy group and 3.7 percent in the medium income adequacy group. Households which reported high scores on philosophical perspective and fell into the extreme categories of income adequacy showed only small overall percentages of reduced consumption (Table 14).

A slight shift from the bivariate contribution was noted in the effect of income adequacy with the addition of knowledge. Since knowledge was negatively related conservation, not in the hypothesized direction, a breakdown was computed for percentage change by income adequacy and knowledge scores. Results indicated that higher level of respondent knowledge was related to the greatest amount of conservation in medium income groups. Knowledge was least beneficial in very low income groups (Figure 4.1).

Age maintained its significant relationship to percent change in consumption. Breakdowns of percent change in consumption indicated that households with older members tended to conserve at approximately the same percentage despite income level. Within both younger and middle-aged populations a curvilinear relationship was observed. Younger households had increased rather than reduced consumption; households within low and medium income adequacy groups had the least increase. With the exception of the very low income adequacy group, middle-aged households showed reduced consumption. Low and medium income adequacy households had reduced their consumption by the greatest percentage (Figure 4.2).

Overall rural households tended to conserve more than did urban dwellers. This difference was especially evident in homes where fuel oil was used (Figure 4.3). Rurality was not a factor contributing to conservation differences in homes heated with electricity. Natural gas users living in cities, however, reported greater conservation than did rural users of natural gas.




INCOME ADEQUACY LEVELS

vl-very low l-low m-medium h-high

Figure 4-1. Percent Change in Consumption by Knowledge by Income Adequacy.



INCOME ADEQUACY LEVELS vivery low I-low m-medium h-high







Figure 4-3. Percent Change in Consumption by Rurality by Fuel Type.

Summary and Discussion of Hypotheses

Findings indicated that 36.4 percent of the households in the research subsample had reduced their consumption of fossil fuel energy within the household by more than four percent. The change in consumption among all subsample households showed a 1.8 percent overall decrease. This was consistent with the findings reported by William, Kruvant, and Newman (1979) based on a national sample of households during 1972 and 1974.

Percentage change in household consumption was regressed onto specified motivators, human resources, and contextual variables to assess their influence on conservation. Findings indicated that one motivator, relative fuel cost, and one contextual variable, age, were significantly related to a change in consumption.

The relationship of fuel cost to percent change in consumption was negative indicating that as the relative cost of the type of fuel used to heat the home increased, households were more likely to decrease their consumption of that fuel. Thus, that part of Hypotheses 2A concerned with relative cost of fuel was retained. Breakdowns of fuel type according to rural and urban residence indicated that rural households using fuel oil and electricity reduced their consumption significantly more than did their urban counterpart.

Income adequacy was determined to have a slight curvilinear relationship with households in the low and

middle adequacy ranges having the greatest conservation. A test for curvilinearity, however, did not prove significant.

Households with low and medium adequacy levels were found to have the greatest percentage of reduced consumption. This was especially true for those households in which the respondent indicated a higher level of knowledge concerning conservation actions, reflected a socially responsible philosophy towards energy issues, and indicated an age range between 36-54.

Since percentage change in consumption was an objective measure obtained from actual utility company records and not from self report, it was determined that the indication of change was in fact a reliable finding. While there are some questions as to the consensus between household members on their responses to survey questions, consensus on measures of income has been found to be acceptable by various researchers, and was used in this study as a measure of the household's ability to purchase goods and services. Philosophical perspective and knowledge, however, are not necessarily representative of the entire household and therefore represent a limitation to the generalizability of their relationship with change in consumption to the household as a whole. More accurately the findings can be interpreted as households in which at least one person expresses a certain

philosophical position or possesses a certain level of knowledge.

Participation in Voluntary Simplicity

In this section two research questions are addressed and the following hypothesized relationships are examined.

Research Question 2.

To what extent are indicators of income adequacy and philosophical perspective towards the energy issue related to a family's participation in voluntary simplicity behaviors?

Hypothesis 1B

Income adequacy is negatively related to participation in behaviors related to voluntary simplicity.

Hypothesis 3B

Philosophical perspective is positively related to participation in behaviors related to voluntary simplicity.

Research Question 3.

To what extent is the availability of human resources related to a household's participation in voluntary simplicity behaviors?

Hypothesis 4B

A positive relationship exists between voluntary simplicity scores and the following human resources.



- 1) Knowledge
- 2) Average Household Education
- 3) Reported Skills
- 4) Perceived Time Availability
- 5) Number of Adults
- 6) Number of Children;

and a negative relationship exists between voluntary simplicity scores and the following human resources:

- 7) Perceived Money Availability
- 8) Number of Employed Adults

Hypothesis 5B

When all motivators and human resources are accounted for the contextual variables of age, home ownership, and rurality should provide no further contribution to participants in voluntary simplicity behaviors.

Similar to percentage change in consumption the total voluntary simplicity score was regressed separately on each motivator, each human resource and each contextual measure in order to ascertain bivariate relationships. Summary data of the bivariate relationships of the total voluntary simplicity scale and predictor variables are presented in Table 15.

Multiple regression analysis was the statistical tool used to test the hypotheses concerned with the interrelationships of the two motivators--income adequacy and philosophical perspective; the eight human resources; and the three contextual variables in explaining variation in reported voluntary simplicity participation. Summary data of the multiple regression analysis performed with Total Voluntary Simplicity as the dependent measure are presented in Table 16.

<u>Findings of the Bivariate Analysis</u>. The results of the bivariate regression analysis for the total voluntary simplicity score are presented in Table 16. All but two of the predictors had significant relationships with voluntary simplicity.

Motivators. Income adequacy and philosophical perspective both had significant bivariate relationships with voluntary simplicity behaviors in the hypothesized directions. The measure of philosophical perspective appeared to be the stronger of the two with a direct effect of .200 and significantly contributed to four percent of the variance in voluntary simplicity scores. Income adequacy had a negative relationship to participation in voluntary simplicity and accounted for less than one percent of the variance. The negative relationship was expected and indicated that as the adequacy of income lowered, participation in voluntary simplicity behaviors increased.

Human Resources. All but one of the human resources had significant positive relationships with voluntary simplicity scores. Three of the bivariate relationships were not in the expected direction. Ability to afford a conservation device and number of employed adults were

hypothesized to have negative relationships; knowledge was expected to be positively related to voluntary simplicity participation.

Reported skills accounted for the greatest individual contribution to the variance, 10.9 percent, in voluntary simplicity scores. The beta weight of .330 was significant with a probability of .000. Time availability was the second highest contributor among the resources and accounted for nearly five percent of the variance with a beta of .214.

Next in order of importance was the number of household occupants. Number of children entered the regression model with a beta weight of .189 and contributed to 3.6 percent of the variance. Number of adults was entered into the bivariate model with a beta weight of .140 and accounted for approximately two percent of the variance.

Ability to afford a conservation device, average household education, and number of employed adults were the remaining human resources investigated. Individual contribution to the variance of the dependent variable was less than two percent for each measure and their beta weights were .132, .121, and .070 respectively. A measure of knowledge was negatively related to the dependent measure with a nonsignificant beta of -.038.

<u>Contextual Variables</u>. Three contextual variables were included in the regression model. Two of the measures,

ury scores as the Ographics as	Significance	.000	.000 .000 .000 .001 .001 .336	.000 .000 .853
urces and Den	F to Enter	26.141 5.312	77.212 30.204 23.345 12.614 9.397 3.074 .928	30.462 19.342 .035
Human Reso	R Square	.040	.109 .046 .036 .020 .017 .015 .005	.046 .030 .000
bles	Standardized Regression Coefficients	.200 091	.330 .214 .189 .140 .132 .121 .070	215 .173 .007
Independent Varia	Independent Variables Motivators	Philosophical Perspective Income Adequacy <u>Human Resources</u>	Reported Skills Time Availability Number of Children Number of Adults Ability to Afford Device Average Household Education Number Employed Knowledge Contextual Variables	Age Rurality Home Ownership

Bivariate Regression Analyses with Total Voluntary Simplicity So Table 15.

123

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age and rurality, have been described in previous literature as influencing voluntary simplicity behavior. Since the primary purpose of the research was to explore voluntary simplicity in terms of motivation and human resources the contextual variables were included in the analysis to determine the extent to which the resource and motivation variables would account for variance previously attributed to demographics.

Age was negatively related to voluntary simplicity behaviors indicating that as the age of the respondent increased the likelihood of household participation in voluntary simplicity would decrease. Age accounted for 4.6 percent of the variance in total voluntary simplicity scores. Rurality had a significant positive relationship with voluntary simplicity behaviors with a beta weight of 0.173 and accounted for three percent of the variance. Home ownership was not significantly related to voluntary simplicity participation.

Multiple Regression Analysis--Voluntary Simplicity Participation

Multiple regression analysis was used to test the hypothesis based on the additional impact of human resources on voluntary simplicity participation. The format of the regression model involved assigning variables specific inclusion levels. Motivators were given the highest priority, human resources were second and contextual variables were given the lowest priority for inclusion.

Two objectives were achieved through use of multiple regression analysis. First, it was possible to determine a predictive model of voluntary simplicity based on selected motivators and human resources. Secondly, the hierarchial format facilitated an exploration of the conceptual model.

<u>Findings</u>. The regression model with all variables entered accounted for 21.7 percent of the variance in voluntary simplicity participation. The equation had a probability of .000. Human resources accounted for an additional 14.8 percent of the variance beyond the 4.8 percent accounted for by the motivators. Two of the three contextual variables contributed to an additional 2.1 percent of the variance.

Motivators. Philosophical perspective was the first motivator to enter the regression model. The positive direction of the standardized regression coefficient (.188) indicated that those households who reported higher scores on the philosophical perspective scale were somewhat more likely to participate in voluntary simplicity behaviors. Philosophical perspective accounted for four percent of the variance as in the bivariate analysis.

Income adequacy maintained its significant negative contribution to participation in voluntary simplicity behaviors. The relative effect of income adequacy increased

	Standardized	œ	ţr	
Independent	Regression	Square	to t	
Variables	Coefficients	Change	Enter	Significance
Philosophical Perspective	.188 (.197) ¹	.040	26.141	.000
Income Ādequacy	154 (154)	.008	5.233	.022
Reported Skills	.238 (.278)	.120	90.652	.000
Average Household Education	.114 (.113)	.016	12.634	.000
Ability to Afford Device	.032 (.052)	.005	3.628	.057
Number of Children	.013 (.065)	.003	2.354	.125
Time Availability	.062 (.053)	.002	1.435	.231
Number of Adults	.053 (.044)	.002	1.390	.239
Number Employed	046	.000	0.320	.572
Knowledge	011	.000	0.265	.607
Rurality	.120*	.014	10.720	100.
Age	128*	.007	5.405	.020
Home Ownership	.018	.000	0.249	.618
Overall F: 13.196 (18.95	50) ¹			
R Square: .217 (.19	96)			
Significance: .000 (.00	00)			

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 ${}^{\tt T}Figures$ in parentheses correspond to statistics relevant to the chosen predictive model.

*

Adjusted \mathbb{R}^2 increased with the addition of Rurality and Age Variables indicating their importance in a predictive model.

from the bivariate analysis as the beta weight rose from -.091 to -.154. Income adequacy accounted for only an additional 0.8 percent of the variance. Together, philosophical perspective and income accounted for 4.8 percent of the variance in total voluntary simplicity scores.

Human Resources. Human resources significantly accounted for an additional 14.8 percent of the variance in voluntary simplicity scores. Of the seven original significant resources only three maintained their significance when other resources and motivators were accounted for. Reported skills was, by far, the most influential human resource. The amount of variance accounted for by skills increased from the bivariate 10.9 percent to 12 percent with a direct effect of .238.

Average household education was the second human resource to enter the regression model. Education accounted for 1.6 percent of the variance with a positive beta weight of .114 significant at a probability of .000. This relative effect lowered only slightly from the zero order effect of .121.

Ability to afford a conservation device was strong enough to enter the regression model on the fifth step with a significant effect. Addition of this variable, however, only increased the variance accounted for by 0.5 percent. This was considerably less than in the bivariate

model where this perception had a significant effect on voluntary simplicity scores with a beta of .132 and contributed to 1.7 percent of the variance. As other variables entered the model their significance to this measure was reduced. When changes in the partial coefficients were observed, the greatest reduction noted in the influence of the ability to afford a conservation device occurred when skill was accounted for in the equation. The remaining human resources did not enter the regression equation at a probability level less than .10.

<u>Contextual Variables</u>. Contextual variables cummulatively accounted for an additional 2.1 percent of the variance. Rurality was the greatest contextual contributor accounting for an additional 1.4 percent of the variance and indicated that the motivation and human resource indicators included in the analysis were unable to totally account for the contribution of rurality to voluntary simplicity behavior. Age accounts for an additional 0.7 percent of the variance, reduced from a bivariate contribution of 4.6 percent. It appeared that motivation and resources were able to account for the majority of the influence of age.

A decrease in the $adjusted R^2$ was used as the criterion for selection of the most appropriate predictive model (Table 16). This decrease occurred at the eighth step in the regression analysis. The resulting model

accounts for 19.6 percent of the variance and is significant with a probability of .000.

A breakdown of the effect of income adequacy on voluntary simplicity scores in the presence of skills is presented in Figure 4.4. The presence of skills within the household is especially influential as the adequacy of income decreases. Low skill availability resulted in lower participation in voluntary simplicity behaviors across income adequacy levels; very low and high levels of adequacy appear the most affected.

Average household education (Figure 4.5) appeared to have increasing influence on voluntary simplicity participation as adequacy of income decreased. This is especially noticeable in the very low income group. The influence of a subjective sense of money availability for a conservation device was less evident. The higher extremes of participation occurred when low income households perceived more money availability. The lowest extreme in participation was evidenced in households with higher income adequacy and when the respondent indicated low perception of money availability.

It was noted that the addition of children to the regression equation lowered the direct effect of income adequacy on voluntary simplicity participation. One child in a household increased participation within each income adequacy level. Two children somewhat reduced participation. Addition of children to a household had the greatest

impact on voluntary simplicity participation in very low income adequacy households.

Summary and Discussion of Hypotheses

The two research questions dealt with in this section were concerned with the influence of income adequacy, an ecological perspective and a variety of human resources on participation in voluntary simplicity behaviors. Overall it was determined that a fairly large percentage of households (75.6 percent) participated in at least some activities which had an underlying dimension of a less energy intensive lifestyle. It was determined that such participation was indeed motivated by the adequacy of one's income and a symbolic value system which suggested a responsibility for one's environment. The first two hypotheses were therefore accepted.

Income adequacy significantly contributed to less than one percent of the variance. The direction of the relationship was negative, as indicated by the beta coefficient of -.154. This finding was supportive of the hypothesis that as the adequacy of one's ability to purchase goods and services within the market place decreased there would be an increase in their production within the home.

Philosophical perspective was a significant contributor to the variance in voluntary simplicity scores accounting for four percent of the variance. The



INCOME ADEQUACY LEVELS

I-very low I-low m-medium h-high

Figure 4.4. Mean Voluntary Simplicity Score by Skill Level and Income Adequacy.



FIGURE 4.5. Mean Voluntary Simplicity Score by Education by Income Adequacy.



The relationship with voluntary simplicity was positive supporting the hypothesis that participation in voluntary simplicity behaviors was related to higher scores on a measure of philosophical perspective.

The findings concerned with the relationship of voluntary simplicity behavior and human resources resulted in the acceptance of only two hypotheses. Reported skills and average household education did contribute significantly in the hypothesized direction. All other hypotheses were rejected.

The addition of human resources to the regression equation accounted for an additional 14.8 percent of the variance. Only three resources; reported skills, average household education, and perception of the ability to afford a conservation device had a significant contribution. Reported skills was by far the more influential resource having a positive relationship with voluntary simplicity and accounting for an additional 12 percent of the variance. Average household education also had a positive relationship with voluntary simplicity. Perception of the ability to afford a conservation device had a positive relationship with voluntary simplicity indicating that as respondents perceived money as available for conservation they were also more likely to report participation in voluntary simplicity behaviors. This was not in the hypothesized direction. A cross tabulation indicated that households who had actually taken actions concerned with direct

conservation of energy were also those households who reported higher levels of voluntary simplicity participation (Appendix C-1). This finding may indicate that households performing voluntary simplicity behaviors were indeed attempting to reduce direct consumption through technical and behavioral changes.

Availability of resources was also found to influence the direct effect of income adequacy on voluntary simplicity participation. As the three significant resources entered the regression model the relative effect of income adequacy increased. This finding indicated that in the presence of skills, education, and perceived money availability, households with less adequate incomes were more likely to participate in less energy intensive lifestyle behaviors of voluntary simplicity. This appears to be a form of resource substitution--the substitution of human labor for money income. Availability of human resources does not appear to influence the effect of philosophical perspective.

A Comparison of Percentage Reduced Consumption and Voluntary Simplicity

To judge which was the more effective in determining conservation, the individual motivators and an index of human resources were each tested as predictors for both direct and indirect conservation. The results of each analysis are reported in Table 17.

Percentage Change in Consumption. Relative fuel cost was the most influential motivator in contributing to reduced consumption explaining 1.1 percent of the variance. Philosophical perspective was the only other motivator to contribute. Human resources were not strong enough predictors to enter the equation. The total model was not significant.

Voluntary Simplicity Participation. Availability of human resources was the strongest contributor to participation in voluntary simplicity behaviors. Both motivators, philosophical perspective and income adequacy contributed significantly to the variance. The increase in standardized regression coefficients from bivariate to multivariate models reinforced the evidence of their interrelatedness.

Contribution of Conservation Behaviors to Personal Control

Lovins (1977) and other conservationists have suggested that participation in less energy intensive lifestyles would result in a lessening of our dependency of fossil fuels and an increase in our sense of personal control over energy needs. The management/decision-making framework of this research also suggested that as one participated in experiences or behaviors s/he would most likely be better prepared for similar situations in the future. Perlman and Warren described this as residuals. Within

Table 17. Regression Dependent Variables	ı Analyses with D Variables and Mo	irect and Indirect tivators and Human	Measures of (Resources as	Conservation as Independent
Independent Variables	Bivariate Regression Coefficients	Standardized Regression Coefficients	R Square Change	Significance
Percentage Change in Consumption				
Fuel Cost	096	108	.012	.011
Fniiosopnical Perspective Income Adequacy Fuel Price Change	034 000 053	028 .016 .002	.000 .000	.514 .713 .995
Overall F: R Square: Significance:	1.78 .013 .131			
Voluntary Simplicity				
Human Resources	.290	.317	.084	0
Fullosophical Perspective Income Adequacy	.200 091	.191 161	.037 .025	000.
Overall F: 29.851 R Square: 14.6 Significance: 0				

the management model used for this research, conservation behaviors were hypothesized to contribute to the development of human resources, specifically, personal control. The following research question was asked.

Research Question 4.

To what extent does participation in voluntary simplicity and/or reduction in household energy consumption contribute to a family's feeling of control over energy related stressors?

Hypothesis 6A

Reduction in the direct consumption of fossil fuels within the household will be positively related to a sense of personal control.

Hypothesis 6B

Participation in voluntary simplicity behavior will be positively related to a sense of personal control.

<u>Findings</u>. The hypothesis was tested using regression analysis. Observation of the bivariate coefficients showed that between direct and indirect conservation the indirect method of voluntary simplicity was the only significant contributor to a sense of personal control (Table 18). Participation in behaviors related to voluntary simplicity accounted for 3.1 percent of the variance. Reduced consumption was actually negatively related to a sense of control as indicated by the positive beta when a negative beta was expected. When motivators, human resources, and contextual variables were accounted for the direct effect of voluntary simplicity participation decreased from .175 to .105. Hypothesis 6B was accepted and Hypothesis 6A was rejected.

Both motivators, five of the human resources, and age had significant total effects on a sense of personal control. The motivators and resources were all positively related whereas age was negatively related. When accounting for the effects of all other variables both motivators maintained a significant contribution. Resources, average household education, perception of available money and number of children enter the model with a significant contribution. Number of children became negatively related to personal control when age entered the equation. Age had a significant yet negative contribution.

Testing the Model

According to the model used to direct the analysis, it was hypothesized that motivations and human resources would result in decisions to behave in ways which would have potential for fossil fuel energy conservation. It was also hypothesized that the motivations and resources could be attributed, at least to some extent, to age and geographic location. The final aspect of the conceptual model was that participation in conservation behaviors would result in an increased or reinforced sense of control over energy problems.

Independent Variables	Standardized Regression Coefficients	R Square	F to Enter	Significance	
Conservation					
Voluntary Simplicity Percent Reduced Consumption	.175 .015	.031	19.986 .133	.000	
Motivators					
Income Adequacy Philosophical Perspective	.120 .147	.014	9.223 13.960	.000	
Human Resources					
Average Household Education	.184	.034	22.167	• 000	
Perceived Money Availability Single-Dual Emploved	.136	.018	11.828 9.652	.001	
Reported Skills	.121	.015	9.376	.002	
Number of Children	.111	.012	7.810	.005	
Perceived Time Availability	.065	.004	2.691	101.	
Number or Aaults Knowledge	.020	100.	.080	.620	
<u>Contextual</u>					
Age Rurality	235 017	.055	36.862 .189	.000664	

Bivariate Regression Analysis with Personal Control as the Dependent Variable Table 18.

Standardized	R	Ч	
Regression	Square	to	
Coefficients	Change	Enter	Significance
105	[03]	19_986	000
600.	.000	.289	.591
.082	.027	18.042	.000
.119	.011	7.083	.008
.068	.008	5.237	.022
.046	.005	3.156	.076
026	.006	4.398	.036
.027	.001	.948	.331
015	.001	.597	.440
030	.001	.439	.508
.014	.000	.034	.853
.004	.000	.012	.913
183	.015	10.337	.001
032	.001	.634	.426
	Standardized Regression Coefficients .105 .009 .082 .082 .014 .027 015 015 030 .014 .014 .014 .014 .014 .014 .0132	StandardizedRRegressionSquareCoefficientsChange.105.031.009.003.011.003.012.011.068.003.019.011.068.003.027.001.0146.006.027.001.014.001.014.001.014.001.014.001.014.001.013.015.013.015.032.015.032.015	StandardizedRFRegressionSquaretoRegressionSquaretoCoefficientsChangeEnter.105.009.289.009.000.289.009.0017.083.119.0017.083.119.0017.083.068.0017.083.119.0017.083.068.0017.083.0117.083.156.027.001948.027.001.948.027.001.948.027.001.948.014.001.948.015.001.948.016.001.948.017.001.934.018.001.034.032.001.012.033.001.012.032.001.034.033.001.012.032.001.012.033.001.012.032.001.012.033.001.012.033.001.012.033.001.012.032.001.012.032.001.012.033.001.012.032.001.015.033.001.012.032.001.012.033.001.012.032.001.012.033.001.012.033.001.012<

Multiple Regression Analysis with Personal Control as the Dependent Variable and Conservation, Motivators, Human Resources, and Contextual Variables as

Table 19.

Overall F: 5.248 R Square: .106 Significance: .000

Based on previous regression analyses a path analysis was constructed to test the overall model. A human resources score was developed from the scores of six resources included in the final regression model for voluntary simplicity: reported skills, average household education, perception of money availability, perception of time availability, number of adults and number of children. The index was computed by first computing a proportion score for each selected resource. This was done by dividing the actual score by the possible score. A total score was computed by summing the proportion score for each of the resources.

Personal control was regressed on each conservation measure, the motivators, the human resource score, and the contextual variables. In addition voluntary simplicity was regressed on income adequacy, philosophical perspective, human resources and the contextual variables. Direct conservation was regressed on fuel cost, age and rurality. The motivators and human resource score were each regressed on the contextual variables.

Age. Age was determined to have a direct negative relationship with a sense of personal control. It was concluded, however, that older persons may not have participated in voluntary simplicity because they did not feel they had the necessary resources. Leonard-Barton and Rogers (1980) arrived at a similar conclusion, noting that older persons were frequently not physically



capable of many of the self-sufficient behaviors required in voluntary simplicity. Older persons, however, did tend to reduce their direct consumption of fossil fuels more than younger households. This relationship, however, contributed to the negative relationship of age to a sense of personal control over energy problems.

<u>Rurality</u>. The direct relationship of rurality to a sense of personal control was nonsignificant. Rural households tended to have lower incomes and a stronger sense of available resources both of which contributed to participation in voluntary simplicity. Participation was a significant contributor to a sense of control.

Income Adequacy had a positive direct relationship with personal control as well as an indirect negative relationship through participation in voluntary simplicity. It was, therefore, concluded that households who were able to substitute human energy for a less adequate income were more likely to sense personal control over problems.

Philosophical Perspective had both direct and indirect positive relationships with personal control. The positive relationship was to be expected since some of the questions related to philosophical perspective were directed towards personal responsibility for ecological problems. The attitude of responsibility not only

influenced the sense of control but contributed significantly to behavior of self-sufficiency and responsibility.

The Measure of Human Resources as a scale did not have a significant direct relationship with a sense of personal control. When resources facilitated participation in voluntary simplicity, however, an indirect positive relationship was noted.

Conservation. Of the conservation behaviors, only voluntary simplicity participation contributed significantly to a sense of personal control over energy problems. As noted previously, however, participation in voluntary simplicity was facilitated through possession of a variety of human resources and both income and philosophical motivation.








CHAPTER V

OVERVIEW

It has become increasingly evident that fossil fuels are limited in their long term ability to meet energy needs. A variety of alternative energy sources have been suggested. Conservation, however, has received frequent attention as a household's contribution to relieving the stress of limited energy resources. The purpose of this research was to explore patterns of energy conservation within the household.

Conservation usually means a reduction of energy consumed directly for heating one's home, lighting, cooling or transportation. Another form of conservation occurs indirectly through limiting the purchase of goods and services produced outside the home. This research was based on a conceptual model of resource management with direct and indirect conservation as results.

Specifically, it was hypothesized that given appropriate motivation and the necessary combination of human resources, households would make decisions concerned with the conservation of fossil fuel energy resources. The ability of households to make direct and indirect purchases



of fossil fuel energy is dependent upon the cost of the energy resource and the adequacy of the household's income to make purchases within the market system. In addition, the symbolic value of fossil fuels may be influential in determining the extent to which household members make direct and indirect purchases of fossil fuel dependent goods and services. Thus cost of fuel, income adequacy and philosophical perspective each served as potential motivators for conservation.

Direct conservation was measured by observing change in the amount of fossil fuel energy consumed in the household during 1977-78 and the amount consumed during 1979-80. Consumption figures were obtained from appropriate utility companies. A measure of indirect conservation was obtained through self-report answers to a series of eleven questions designed to determine a household's participation in activities related to self-sufficiency, recycling, and contributions to ecological organizations. These activities have been previously defined as representative of a lifestyle of voluntary simplicity.

Both direct and indirect conservation may require human resources in order to act upon a sense of motivation. A variety of human resources may be required. For this research, however, eight were selected from the available data base: reported skills, average househol education, knowledge of conservation actions, perception of money



availability, perception of time availability, single or duel employment.

Multiple regression was selected as the analysis procedure and provided for the examination of two issues relevant to the research conducted for this report. First use of regression with hierarchial inclusion of independent variables to the equation facilitated the development of the predictive model based on a previously defined conceptual model. Secondly, multiple regression analysis facilitated an examination of the impact of human resource availability on the motivation variables.

Summary of the Findings

Direct and Indirect Conservation Practices. The first question explored by this research was concerned with whether or not households were actually practicing direct and indirect conservation of fossil fuel energy. Analysis of household consumption of fossil fuel energy determined that approximately one-third of the sampled households had reduced their consumption by more than four percent during the 1979-80 heating season as compared to the 1977-78 heating season. The mean percentage change in consumption for all households in the research subsample indicated that an overall reduction of 1.8 percent was observed.

Answers to each of the eleven voluntary simplicity questions were scored and totaled to provide an index of potential indirect conservation. Reliability of the index



was low to moderate with an alpha of .59. The questions were felt to have conceptual validity, however, and all were retained for further analysis. Approximately threefourths of the households had at least occasionally practiced some of the behaviors; approximately one-fifth of the households reported active participation.

To better understand components of the index, all questions were factor analyzed. Four factors were delineated and defined as self-sufficiency in services, selfsufficiency in goods, self-sufficiency in food, and recycling. One question concerned with contributions to ecological organizations did not load on any factors but was retained as an individual factor.

Frequencies of these factors indicated that about 50 percent of the households actively recycled glasses, jars, and newspapers. One-third of the households actively provided services within the home. These included changing the oil in the car, obtaining skills, riding a bicycle for exercise and exchanging goods and services with others. Approximately one-third of the sample produced all, or most of their fruits and vegetables. An even smaller percentage, 13.5, were actively producing their own gifts, clothing or furniture.

The Effect of Motivators on Conservation Behavior. The effect of motivators on direct and indirect conservation was the focus of the second research question. Four



motivators were investigated for their effect on direct conservation. Relative fuel cost, relative shift in fuel cost and income adequacy were selected as financial motivators. An index of responses to six questions was chosen as a measure of the symbolic value of fossil fuels and was defined as the household's philosophical perspective. Income adequacy and philosophical perspective were also chosen as motivators for indirect conservation.

Indicators of conservation were regressed onto each of the motivators to determine the relative effect of the motivators on the conservation behaviors and also to determine the strength of the measure as a predictor of conservation. Only relative fuel cost proved a significant indicator of direct conservation. This finding indicated that as the cost of fuel increased households were somewhat more likely to conserve. Fuel cost actually contributed to less than one percent of the variance in direct conservation.

Income adequacy was not a significant contributor to the variance in direct conservation. The contribution of income adequacy to indirect conservation, however, was significant, p = .022, yet contributed to less than one percent of the variance. The direction of the relationship indicated that as the adequacy of a household's income decreased the likelihood of voluntary simplicity participation increased.

Philosophical perspective was included in the final regression equation for direct conservation but contributed



only .l percent of the variance. Philosophical perspective was more influential in predicting participation in voluntary simplicity behaviors, significantly accounting for four percent of the variance.

The Effect of Human Resources on Conservation

Eight human resources were assessed for their direct influence on conservation and for their effect on motivation. To test the hypotheses related to the third research question hierarchial regression analysis was employed. This procedure involved assigning inclusion levels to the various measures. Motivators were given the highest inclusion value. Human resources were added to the model following the motivators. Results indicated that human resources had little to no direct effect on direct conservation.

On the other hand, the availability of human resources contributed significantly to participation in voluntary simplicity. Reported availability of skills was especially influential accounting for an additional 12 percent of the variance. Availability of skills was positively related to participation, thus, the more skills available to a household the more self-sufficient the behavior of the members. Average household education was also a significant contributor to participation in voluntary simplicity behaviors. A higher educational level



tended to indicate greater participation and accounted for 1.6 percent of the variance.

The final predictive model for voluntary simplicity participation accounted for 19.6 percent of the variance with a probability of .000. Both motivators and six human resources (reported skills, average household education, perception of ability to afford a conservation device, number of children, perception of time availability, and number of adults) were included in the final model. The final predictive model of percentage change in consumption included only motivators and accounted for only 1.3 percent of the variance.

Management of resources within the household was theoretically said to have an outcome beyond the actual behavior. The behavior itself was hypothesized to have the potential for developing or reinforcing the development of motivation and human resources. The final research question of this study was concerned with the effect of the participation in conservation on a sense of personal control.

The relationship between direct conservation and personal control did not prove to be significant. Indirect conservation or voluntary simplicity participation, however, showed a significant positive relationship. This indicated that as a household's participation in voluntary simplicity behaviors increased it was more likely that they would also experience a sense of personal control. Voluntary



simplicity participation accounted for 3.1 percent of the variance.

Conclusions and Implications

The limitations of fossil fuel reserves in meeting future energy needs has brought about an awareness that society and, therefore, households will undergo change while adapting to shortages, increased fuel prices, alternative energy resources, and possible future lifestyles. The changes which occur will be the result of a variety of decisions.

Those persons with a single goal of providing new energy sources are primarily making technological decisions. Others are concerned with the alternative uses of available energy and are said to be involved in making economic decisions. Lovins (1977) and other conservationists have expressed concern that social decision making be included into the process of decision making regarding present and future energy problems. The conservationists are especially hopeful that the social decisions will evolve around a philosophy of humanistic rather than capitalistic ideals.

This research was especially concerned with specific aspects of lifestyle which might facilitate technological and economic decisions of energy usage. It was assumed that households make decisions regarding both direct and indirect consumption of nonhuman energy sources.



Households were then seen as capable of making decisions regarding direct and indirect conservation of energy.

It was concluded that direct conservation was significantly motivated by the relative cost of the fuel used by the household. Cost of fuel, however, was not a strong predictor. Social decisions as measured by an index of philosophical perspective, did not appear as significant indicators of direct conservation.

On the other hand indirect conservation, as measured by an index of voluntary simplicity behaviors, was influenced by both financial and philosophical motivators. A socially responsible philosophy was a stronger contributor than finances indicating that indirect conservation may indeed represent a form of voluntary conservation at least for some households. The contribution of voluntary simplicity to a sense of personal control was supportive of the arguments made by conservationists that a more humanistically oriented production-consumption system is conducive to the development of human resources.

This research added another dimension to the knowledge of voluntary indirect conservation. The importance of skills and education to practicing voluntary simplicity behaviors indicated that despite a household's motivation it was necessary to have skills and knowledge of behaviors.

The conclusions of this research, as should be the case, gave relevance to a variety of other issues



concerning direct and indirect energy conservation. The importance of technical, economic, and social decisions was supported.

Implications for Energy Policy and Educational <u>Programs</u>. This research attempted to address, at least in part, the voluntary nature of conservation. The average household was directly conserving fossil fuels at a rate of approximately 1.8 percent. It appeared, however, that only one-third of the sampled households were actually doing the conserving. There are, therefore, households which may provide a target area for conservation programs.

This particular study did not provide a statistically significant description of those households. There is, therefore, a sense that household participation in direct conservation is so diverse that continued generalized educational efforts would contribute to a long term socialization based on direct conservation. Knowledge of conservation techniques was not found to be related to direct conservation, therefore, educational efforts must focus on all aspects of conservation behavior.

Assuming that a lifestyle of voluntary simplicity is potentially a less fossil fuel intensive lifestyle, the importance of education and possession of skills was made quite evident in this research. Education appears to be influential in expanding the acceptable choice of lifestyle alternatives. The possession of skills provides the ability to implement the chosen lifestyle.



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The importance of skill availability brings forth two relevant guestions concerning what Paul Diesing might describe as legal and political decisions. Historically, the female has been responsible for producing many of the goods and services within the household. The male role has been to participate in the production force outside the Initial responses to limited resources or crisis home. periods is frequently to return to known ways of behavior. Social rules and/or legal decisions regarding who has what skills or performs which behaviors set up subtle sex role stereotypes. In addition, the value of productive activities to society define a person's social and political (decision-making) status. Determining the targeted audience for productive household skills must require futuristic consideration as to many desired social or lifestyle goals. In addition, solving problems related to fossil fuel limitations must also involve long-term considerations as to specific social and political roles of society's members.

Implications for Future Research. As analysis of the data used in this research progressed a variety of questions arose which could be potentially answered through further research. Specifically, the actual contribution to direct conservation of fossil fuel energy by households which participated in voluntary simplicity behaviors needs to be considered. At present, households participating in

voluntary simplicity behaviors are not necessarily those households making reductions in their direct consumption of fossil fuel energy. Further analysis is needed to more completely determine the relationship between indirect and direct conservation.

The interrelationship of direct and indirect conservation should involve analysis at both macro and microlevels. This research should include further analysis of direct consumption patterns of households participating in voluntary simplicity versus those households not participating. This analysis should test hypotheses that voluntary simplicity participants are already low consumers of fossil fuel energy. This test should look at transportation uses of energy as well as energy consumption patterns for space and water heating. Further analysis of the data available from the evaluation of Project Conserve could provide a macro perspective. A case study approach of household patterns of consumption would provide a micro analysis of this question.

Hypotheses based on the assumption that voluntary simplicity behaviors are actually indirect methods of conservation needed to be specified and tested. To make decisions regarding use of human energy in place of fossil fuel, solar, or nuclear energy, the decision-maker needs information regarding actual energy required for each. Only with such information can decisions relating to appropriate technology be efficient.

The above mentioned research questions are concerned primarily with technical and economic decisions. From the perspective of family economists and management specialists a variety of questions related to social decisions also remain unanswered. These questions are concerned with who performs conservation behaviors, what status the behaviors achieve in society, and what potential exists for more equitable distribution of skills within the home for performing home production activities.

Implications for Family Theory. A management model was used in this research to explore motivation and human resource influence on conservation behaviors. The specific variables included in the management model in this research provided a partial model for understanding voluntary simplicity participation. Further identification of variables is needed to expand understanding of the management process related to energy conservation--both direct and indirect conservation. Additional clarification and more specific operationalization of variables concerned with value motivators are greatly needed. Greater identification of tangible and intangible, human and nonhuman resources is also necessary.

In addition, the management model used in this research is limited in its analytical benefits toward the management process. Specifically, this research was limited in its focus on evaluative feedback--a critical



component of the management process. Expansion of the model probably necessitates a more micro level application of the model.

Based on this research, however, the concept of exchange was especially evident. Families with less adequate incomes were more likely to substitute skills to increase self-sufficiency in goods and services within the home. From this perspective, management models should provide frameworks beneficial to the exploration of family change and adaptation in an environment of various levels of resource availability. APPENDICES



APPENDIX A



Conservation I Should The Present Level of Makes A be concerned Living beprives the World Continue Strongly Agree 47.6 43.7 15.2 Agree 46.9 51.3 37.0 Agree 1.9 37.0 15.2 Agree 2.5 1.9 37.0 Agree 2.0 2.0 1.9 37.5 Strongly Disagree 2.0 2.0 1.1 6.1 Missing My Family is Entitled U.S. Citizens Are Entitled To Use As Much My Family Disagree 1.7 4.1 1.6 Strongly Disagree 1.7 1.1 6.1.3 Strongly Disagree 2.0 2.0 2.0 1.6 My Family is Entitled U.S. Citizens Are Entitled 1.6 My Family is Entitled 0.5 1.1 6.1.3 Strongly Disagree 56.0 51.9 51.9 Strongly Disagree 56.0 20.2 51.9 51.9 Strongly Disagree 56.0 20.2 51.9 51.9				IG TOTAL GUTTE			
Strongly Agree47.643.715.2Agree46.951.337.0Disagree2.51.19Strongly Disagree2.01.16.3Missing2.02.01.16.3Missing2.02.02.01.1Missing2.02.02.01.1My Family is EntitledU.S. Citizens Are EntitledMy Family My Family is EntitledU.S. Citizens Are EntitledMy Family Agree1.71.6Strongly Disagree56.054.9Strongly Disagree20.23.9Strongly Disagree20.23.9Strongly Disagree20.23.6Strongly Disagree20.23.9Strongly Disagree20.23.6				Conservation Makes A Difference	I Should Be Concerned About Future	The Present Level of Living Deprives the Poor Throughout The World	Continued High Level of Living
My Family is Entitled U.S. Citizens Are Entitl To Warever Goods To Us A Much Me Can Afford Energy as Needed Strongly Agree 1.7 1.6 Disagree 56.0 Strongly Disagree 20.2 Missing 3.9 Missing 3.9		Strongly Ag Agree Disagree Strongly Di Missing	ree sagree	47.6 46.9 2.5 .9 2.0	43.7 51.3 1.9 2.0	15.2 37.0 6.3 4.1	21.3 23.4 3.3 4.5
Strongly Agree 1.7 1.6 Agree 1.8 14.3 Agree 56.0 54.9 Strongly Disagree 20.2 25.7 Missing 3.9 3.6	159			My Famil To Wha We C	y is Entitled tever Goods an Afford	U.S. Citizens Are To Use As Mu Energy as Nee	Entitled cch ded
		Strongly Ag Agree Disagree Strongly Di Missing	ree sagree		1.7 1.8 56.0 20.2 3.9	1.6 54.9 25.7 3.6	



APPENDIX B



Control	over Energy Problems	THIS ASTECHICITY TO STATEMENT	us veyarumiy retsoma.
	Can't Do Anything About the Energy Problem	Little Control Over Energy Use	Life is a Matter of Luck
Strongly Agree Agree Disagree Strongly Disagree Don't Know Missing	2.7 14.9 15.4 1.4 1.4	2.4 11.6 62.55 23.2 0.3	1.6 13.3 67.2 15.8 1.1
	If Family	Planned, Can Reduce	Can Get What I Want From Life
Strongly Agree Agree Disagree Strongly Disagree Don't Know Missing		9.7 72.3 14.9 2.2 0.9	24.0 4.5 0.6 0.6

Percentage of Households Reporting Agreement to Statements Regarding Personal Table B-1

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APPENDIX C

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Table C-l.	Voluntary Simpl	icity Score (1980) by
	Catagorical Lev	el of Conserv	vation Actions
	Taken, 1980. (N=638)	

Conservation Action	Voluntary Simplicity Mean Score	(N)
		(11)
Low	1.30	254
Medium	1.60	294
High	1.80	90

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