When we speak of pressures on the natural environment, we should speak more about home loans, old-age income, and women drivers, more about shrinking households and all-night shopping, and perhaps less about coal mines and pulp mills. In this essay I will argue that the precise nature of the demands for services that we collectively create increasingly shape environmental change. While the ways we farm, mine, and manufacture surely transform the environment, the end points of economic activity, what we consume, how we actually live—“life-styles,” in short—are no less important.

Because significant energy use accompanies or allows for most human activities, I choose energy use to indicate the overall level of environmental disruption. Of course, environmental impacts arise also from the volume and selection of materials we employ, the ways we alter water courses and habitat, and numerous other activities. Moreover, I do not want to attach an environmental stigma to energy, which we use precisely because it serves us so well. But, for any given mix of fuels and remediative techniques, the level of energy use does provide a reasonable proxy for the environmental impact of human activities. We also know that changes in technology, both to improve efficiency and to shift energy sources, can reduce emissions and other unwanted fallout per unit of service (see Nakićenović, this volume). So can changes in the levels of services demanded, stimulated by changes in incomes, prices, or, as I shall emphasize, life-styles.

To give human meaning to the link between energy and life-styles, consider the atmospheric emissions per capita of carbon dioxide, the gas that is most threatening climatic change, in 1973 and in 1990 from the energy-using activities of the households of five countries (Figure 1) (Sheinbaum and Schipper, 1993).
The figure demonstrates the diversity of social circumstances and the means to increase energy services while environmental fallout moderates, as well as our ability to reveal connections between emissions and specific activities.

FROM PRODUCTION TO PLEASURE

What a society makes still matters. In fact, changes in the mix of productive activities forming the economy have profoundly altered energy use in recent decades. Between about 1970 and 1990, structural changes reduced energy consumption by 10 percent or more in the United States, Japan, and West Germany, compared with demand that would have arisen had the mix of production remained constant (Howarth et al., 1993; Schipper et al., 1992a). The main change has been a reduction in the role of manufacturing, which has accounted for 30 to 40 percent of energy use in industrialized countries. Improvements in the energy efficiency of manufacturing have also significantly tempered the growth in energy demand (Schipper, 1993). Energy-use efficiency is still improving by 1 to 2 percent per year in manufacturing.

Energy-use efficiency has improved more slowly in households, services, and transport. In fact, changes in the ways consumers use energy—for comfort at home and personal mobility, for example—have raised energy use in all these sectors. The sum of the recent changes in energy demand is essentially a shift in
prominence from producers to individual consumers and to the collective consumption of the service industries (retail stores, office buildings, and the like).

This shift from “production to pleasure” has been distinct in Germany and elsewhere, and in formerly planned economies, such as Poland, it has been drastic (Figure 2) (Schipper et al., 1989). The rapid changes after the fall of the old communist regime in 1988 and 1989 shrank heavy industry relative to other activities in the Polish economy, while travel climbed, beginning from a very low base. Energy use and restructuring in all the former Soviet economies has essentially resembled that of Poland (Cooper and Schipper, 1992). For a time, the shift was barely discernible in the United States because energy savings from smaller private cars stabilized growth in energy travel demand; however, recent trends toward larger personal vehicles and higher speed limits are now causing growth to resume.

Excepting infrequent, dramatic events of the kind that occurred in Central and Eastern Europe, energy demand does not change much in the short term unless energy prices or incomes change, in turn causing changes in the demand for energy services. In the medium term, however, the systems converting energy to services, such as hot food or cool air, may be modified, renovated, or replaced, and these changes in capital stock and associated techniques allow for enormous changes in energy requirements per unit of service. Individuals also do not generally change their energy-demanding behavior rapidly, but they can and do modify their comfort and mobility patterns somewhat. The changes may be temporary, as was the case in the United States in response to the oil price shocks of the 1970s. In the long term, because technologies, human behavior, and populations all change, quite different patterns and levels of energy use can emerge. The poten-

FIGURE 2  Contrasting trends in energy use for manufacturing and travel.
tial for technological changes that save energy and other resources has received much attention (Schipper, 1993; Schipper et al., 1992b). In this essay, the focus is on life-style and the related factors that affect the level of energy services demanded—raising or lowering resource consumption, or changing the “resource intensity” with which incomes are disposed.

Life-style is a rubric that covers numerous activities in which individuals engage. These include spending for personal consumption, owning and using goods, and travel. Life-styles reflect social and demographic characteristics, including the age and employment status of individuals and the size of families. Life-style choices may occur at the level of the individual, the household, or much larger groups; they relate primarily to money and time, to how much time, for example, is spent outside the home. Life-style characteristics are not independent; families with small children, for example, may need to spend more time at home than those without children. Life-styles evolve in response to changes in income and taste.

CONSUMPTION EXPENDITURES

Savings as well as present and projected income constrain the goods and services that households are able to purchase in any given year. How households allocate their incomes among goods, services, and savings reveals economic preferences, and consumer expenditure data show how much money average households spend for various goods and services. Since 1970, households in many countries have spent substantially more for transport, primarily on automobiles and other travel services (Schipper et al., 1989), and this change favors increased energy consumption.

Difficulties in translating money into quantities of activity limit the direct use of expenditures to assess impacts on energy and the environment. For example, what kinds of equipment were consumers purchasing when they spent for “household appliances”? How much energy did such appliances require? If consumers were spending more money for meals taken out of the home, how many kilometers were they traveling to secure those meals? Was an additional expenditure for recreational goods used in the home, at a neighborhood gymnasium, or in more distant ski country? Consumer expenditures present an aggregate picture that has to be connected to the infrastructure of consumption, reflecting the ownership of and access to energy-using goods.

The characteristics of the stock of energy-using goods in personal and social infrastructures indicate how consumers use energy. During the 1950s and 1960s in the United States and during the 1960s and 1970s in Europe, ownership of central heating systems increased steeply (Figure 3), while home area increased as well (Figure 4). Automobile ownership grew in Europe, moving toward US levels (Figure 5). Because central heating systems tend to use twice as much energy per square meter of floor space as room heaters, and because personal
transport uses more energy per passenger-kilometer than mass transit, personal energy use rose rapidly in America and Europe. The increase in home heating and car ownership alone probably doubled per capita household energy use in Western Europe between 1960 and 1990. The increases in ownership raised energy demand more than the changes in the use of the systems, such as the hours of heating in homes equipped with central heat. By the late 1980s, growth in ownership of many kinds of equipment slowed both in the United States and in other high-income countries. However, the acquisition of key energy-intensive personal goods continues in Japan up to the present.

Greater income has not, however, always led to proportional increases in energy use, principally because the goods subsequently purchased did not necessarily consume energy at the high levels of heating or cooling systems. Moreover, as the ownership of equipment approaches saturation—with every household owning a given device, and every person with a driver’s license having at least one car—the characteristics of these products and their overall utilization become increasingly important in determining energy use. Because successive vintages of the same goods tend to improve in efficiency, increases in the level of ownership have had a declining impact on the growth of energy use through the 1980s and 1990s. Of course, new energy-intensive appliances may appear on the market. As yet, the energy intensity of the sharply rising number of information-handling devices such as computers and printers remains unclear.

Data for newly industrializing countries, former socialist economies, and developing countries show a large gap in their ownership of goods as compared with the United States and Western Europe. The gap between Eastern and Western Europe was narrowing even before the political and economic changes of the late 1980s. Fed with costly imports of used Western cars, the gap in car owner-

**FIGURE 3**  The rise of central heating.
ship, which accelerated after 1989 in Poland, continued to shrink even as the economies of the former East bloc were in collapse—suggesting strongly that individuals will do almost anything to acquire the personal mobility previously rationed or restricted (Meyers et al., 1993) Recent construction in Poland and other countries points to an analogous reach for housing space.
TIME AND DISTANCE

Surveys reveal how much time individuals spend in various activities during the course of the typical day or week (Gershuny and Jones, 1987; Szalai, 1972). Time budgets classify activities by purpose, such as paid work, leisure, and travel, and sometimes by location, at home or at work. A group of Americans surveyed in 1985, for example, spent about 6 percent of their weekly time traveling, 14 percent at work, and 70 percent at home, half in sleep (Robinson et al., 1988). Changes in the time spent performing any given activity require trade-offs with other pursuits.

People appear to be gradually changing the ways they spend their time. For example, leisure time in the United States was slightly lower in the 1980s than in the 1970s, but slightly higher in Europe. Surveys suggest Americans, Swedes, Norwegians, and Danes are all spending more time away from home (Carlsson, 1989; Ketterød, 1992; Mogensen, 1990). To see whether this trend is reflected in mobility, we next review measures of distance traveled.

Countries differ much more significantly in per capita travel when measured in distance rather than in time, indicating a variation in average travel speed. Speed, of course, demands energy. Americans continue to travel almost twice the passenger-kilometers of Europeans (Figure 6). In the United States in the 1960s, the level of travel already exceeded the level of much of Europe today, yet US travel continues to increase. In North America, the automobile accounts for 85 percent of personal miles traveled, and in Europe more than 80 percent. Air traffic continues to increase, providing most of the remaining distance traveled in the United States. Distances traveled by bus and rail have remained at about 3 percent of total US travel since the early 1970s, but their share is falling in Europe.

At present, Americans and Europeans spend about 1 minute traveling for every 4 to 5 minutes spent in out-of-the-home work, leisure, and shopping activities (Gershuny and Jones, 1987). Americans go faster for a slightly longer time; consequently they travel considerably farther. Russians travel far shorter distances than do Americans or Europeans, but they face commute times as long as Americans because most must travel circuitous routes on mass transit, even where direct distances to work are small.

The high level of US travel and its continued growth make improbable the view that per capita travel distance has reached saturation anywhere. In fact, no country shows evidence that travel distance has saturated.1 Suggesting the contrary, people have been spending somewhat more time away from home. Unless people travel shorter distances to services, work, and leisure, or make fewer trips, energy demand for transport will increase in the absence of a change to a markedly more energy-efficient travel technology.
POPULATION AND HOUSEHOLD CHARACTERISTICS

Demographic characteristics affect the use of homes, commercial buildings, and transport services. The household is the most important unit to consider, because most energy-using goods in homes or on the road are shared by several household members. Changes in household size and age distribution, the nature of employment, and urbanization affect the use of energy-consuming goods.

Energy use in households increases more slowly than household size. In fact, it can reasonably be represented by the square root of this quantity. Smaller households use more energy per capita than larger ones when comparisons are made to control for income, fuel type, and other like factors. This relationship matters greatly given the worldwide trend toward smaller households, most conspicuous in developed countries. Couples now marry later and have fewer children. Children tend to leave the family home earlier in life than they did in the past, increasing the number of single-person households. And, people are living longer. Between 1960 and 1985 household size fell from 2.9 to 2.4 in Sweden, from 3.6 to 2.6 in the Netherlands, from 3.4 to 2.8 in the United States, and from 4.5 to 3.2 in Japan. Roughly speaking, the declines can be expressed as increases in the number of housing units per capita; these increases caused per capita household energy use to rise by 15 to 25 percent. Considering larger household
sizes in the countries of the former Soviet Union (3.5) and in developing countries (well over 4 in the newly industrializing countries and even higher in less-developed countries), shrinking households loom as a profound force making for higher energy use.

The ages of household members also determine energy use. For example, in the United States “elderly singles” (sixty years or older), with only 10 percent at work, will tend to stay at home a good deal more than younger singles. Not surprisingly, these single elderly people on average use more energy than younger singles for both heating and appliances, though the low-income elderly use less (Diamond, 1987). Because elderly singles own fewer cars and drive considerably less than others, there is some savings here.

Generally, energy use in the home evolves as the family moves through its life cycle (Schipper et al., 1989). Residential energy use typically increases with the birth of children and then rises slightly, peaking when the children are in their teens (Gladhart et al., 1986). Comparisons of family types show that “couples with young children” use less energy than “couples with old children,” even when family size is virtually the same. Because income tends to increase as family members move through their career paths, family-cycle and income effects may combine, leading the growing family to move into a larger home, and thereby increasing space-heating energy use. Because driving rises with age and then falls for both men and women (Figure 7), the energy-use cycle is reinforced, though overall societal mobility is rising over time.

Great differences in per capita energy use reflect differences in household composition. In the United States, the typical family with children (married parents, 2.1 children) uses the least energy per capita, but comprises a declining share of the total number of households. Single-person households, households consisting of unrelated persons, single-parent households, and elderly households are increasing almost everywhere. This shift tends to raise per capita energy use in households and transport as well.

Subtle changes in energy use can occur as the demographic structure of society evolves. Fewer children means more time available for leisure and also for work for women. Indeed, female participation in the labor force has increased steadily since 1950 in the United States and in other developed countries. For families where both parents work, automobiles allow parents to visit schools, run errands, and commute to workplaces within very tight time constraints. Not surprisingly, two-worker households, increasing today in all countries, have significantly different driving patterns than one-worker households.

The growth in the number of elderly as a share of the total population in industrialized countries also matters for energy. In 1985 the US elderly spent one hour more per week traveling for leisure than the national average. Although they drive far less than younger cohorts, the distances traveled are increasing over time. In addition, people over the age of sixty-five spent five more hours than the national average per week using electronic media in the home. Extrapolation of
present patterns would suggest that energy use for driving will diminish as the population ages, while home energy use will grow as more one- and two-person “elderly” households are formed.

The life-styles of the “elderly” are themselves changing. A new generation of active retirees is forming, whose energy-related behavior is not known. Tomorrow’s energetic retirees may carry with them the mobility patterns of their younger years, continuing to live in homes originally built to house families with two or three children or in sunbelt homes that require substantial air conditioning. Although these retirees will eventually swell the ranks of the less-energetic geriatrics (those in their high eighties and nineties), their energy use may remain high on a per capita basis, particularly if they keep their previous energy-using capital (homes and cars) and habits (heating, cooling, driving, flying).

The demographic changes intertwine not only with income effects but also elements of public policy. Indeed, public policy influences income indirectly by controlling the cost of services through subsidies or taxes. Public child-care facilities and liberal maternity-leave policies, for example, mean that more women are able to work. The continued growth of the elderly segment of society will depend on our ability to pay for high standards of medical care, and the increased number of people living alone must reflect their being able to afford such independence. The ability of the elderly to continue to live in their family homes depends on how well their savings and pensions, including social security, support them in retirement. One reason for larger household size in the former Soviet Union, for example, is simply that parents live with children and grandchildren out of financial need, which in turn depends on social norms but also on government policies.
Culture, custom and tradition, and government policies all affect energy use by influencing how and where people live, how they move about, what they do. The role of women in society, to take an area of major change, illustrates the powerful relationships between social mores and energy use. More women currently participate in activities previously dominated by men. A greater number are employed and are obtaining higher education, delaying and even forgoing marriage and childbearing. More single people and more childless couples mean more households and thus greater energy use.

A less noticed change with respect to women relates to their driving habits. At any given age, except above age sixty-five, the share of women with drivers’ licenses almost equals the share of men. Increases in women driving, particularly for work-related purposes, was an important reason for the increased driving per capita in the United States between 1969 and 1990, as suggested in Figure 7 (Federal Highway Administration, 1982, 1986, 1991). If women in the United States still drive only half as much as men, the gap is narrowing (Hu and Young, 1993). Closing the gap both in participation and distances driven could increase gasoline use significantly in many countries.

Where people travel is a function of social traditions that often limit the times when specific facilities are open. Longer opening hours for shops, places of work, and places of entertainment has led to more off-peak use of transport and greater utilization of buildings and, therefore, heating, lighting, and air conditioning during these extra hours. When these services opened only during restricted hours—still the case for shops in much of Europe—demand for transport peaked accordingly, with little demand during off-peak hours. In the United States, “seven-eleven” shopping hours have become common in many large downtown stores and in shopping malls, as well as in convenience stores. Attitudes and policies toward restaurants and entertainment also affect the likelihood that people will spend leisure time out of their homes. Company and tax policies favoring entertainment expenses influence how much people choose to go out.

Extended hours allow a given building to be exploited for longer periods. Whether this extra use raises or lowers energy consumption per unit of income generated (or per visitor or employee) depends on the ratio of the extra energy required for keeping the building open to the additional business generated. But compared to erecting two separate buildings to accommodate a given level of business, increasing the opening times of a single building for the same business would appear to reduce the fuel and electricity required to support a unit of business activity.

Extending the number of hours also entails extending working hours, leading to longer workdays or more part-time jobs. Changes in working hours influence energy use both in transport and in buildings. Shorter or more flexible working hours may encourage combined trips for shopping and work. At the same time,
however, increased part-time work means a greater number of commuters. One
social change that may reduce occupancy in service-sector buildings is the in-
creased use of the home for conducting paid work (telecommuting) and accessing
services (through, for example, shopping-by-mail catalogs, or electronically by
television or computer). This change alters both commuting and home energy-
use patterns, reducing occupancy in places of employment and services.

Not all “work” appears in national accounting systems. “Informal” or unpaid
work for oneself (do-it-yourself) or for others (baby-sitting and bartering) may be
increasing today (Bonke, 1986; Sanne, 1988). These changes in work patterns
may change the utilization of buildings, if people choose to stay home more
(Sanne, 1988). The rise in informal production may also affect travel: when
services or do-it-yourself activities are important, people tend to remain in their
neighborhoods, where they may know their neighbors and obtain trusted ser-
VICES. Similarly, “producing” services with inexpensive equipment, rather than
paying for these (renting a film for the video-cassette recorder instead of going to
the movies), also represents a significant shift in the way goods and services are
produced (Gershuny and Miles, 1987).

In short, the very notion of how and where individuals “produce” in society
may be changing, and with this may come a change in the amount, type, and
location of energy use. The principal impact appears to be the transference of
work from manufacturing or services into the home. The energy implications so
far are small, but they could become significant if the energy demands of the
information economy become large and pervasive.

Taxation policies may also affect personal energy use. For example, tax
benefits for payment of mortgage interest stimulates the construction or purchase
of single-family dwellings. In the United States, tax rules permit unlimited de-
duction of mortgage interest payments from taxable income; this same benefit is
limited in most European countries. While US authorities permit almost no de-
ductions for commuting costs, these are directly deductible in Sweden, or indi-
rectly subsidized through light tax treatment of company-provided cars or
company-subsidized transit tickets in the United Kingdom and Germany. Changes
in such rules demonstrably and rapidly alter the type and location of homes built,
the kinds of cars purchased, and the ways in which they are used. The result is
larger homes built farther apart and, in countries with liberal company-car poli-
cies, larger cars and additional driving. During most of the 1970s and 1980s,
about one-third of all new cars bought in Sweden were provided for employees
by companies for personal use (Schipper et al., 1993); on the average, they were
considerably heavier and more powerful than the so-called private cars.

A US-Sweden comparison offers other insights into how policies and cus-
toms may have an important indirect effect on energy use. While tax policy
favors home ownership in both countries, housing policy in Sweden for many
decades favored the construction of apartments (Schipper et al., 1985), while no
such policy has taken hold in the United States. As a result, Swedish cities are
more compact, and the proportion of apartments in the total dwelling stock, many owned by their occupants, is higher in Sweden than in the United States or in most other European countries. Still, the space heating consumption in apartments in Sweden is higher, on a per capita or unit area basis, than in single-family dwellings (Schipper, 1984), and this is because few apartments are metered individually for actual heat consumed. Thus, there is no clear evidence that housing policies in Sweden have led to energy savings in households as a result of the differences in the kinds of dwellings built. Some would argue, however, that the high share of apartments in compact settlement patterns encouraged the use of mass transit, which held steady in Sweden during the 1970s and 1980s. The fact that Sweden has the highest ownership of second or “summer” (now often winterized) homes is probably related to the high share of apartments in the ordinary housing stock. As Fredbaek (1979) noted, fuel and electricity used in these homes is small compared to what is used in the principal homes, but the fuel used commuting back and forth turns out to be significant. As compensation for living in compact settlements in cities, Swedes travel back and forth frequently to their summer homes.

National policies affecting the social security system and care for the elderly may have large energy implications. In Scandinavia, for example, liberal pensions permit retirees to travel and lead active independent lives; concerns about retirement force Japanese families to save more and live together longer. Changes in the leisure time that societies formalize through paid vacation and holidays also affect energy demand. If people choose to work fewer hours, they may find themselves with significantly more free time. Scandinavians, for example, have as much as six weeks paid vacation; their paid holidays are substantially greater than any enjoyed by workers in the United States. A key issue with respect to energy is whether these vacations involve travel, staying at home, or making a single trip to a summer home. Free time in general has become much more travel-dependent. It is obvious that the evolution of customs and policies has changed how and where money is both earned and spent. On balance, governmental policies have encouraged personal energy use.

If higher incomes, demographic changes, and government policies feed the demand for energy, what has been the net effect, including changes in efficiency, on the demand for energy in major sectors related to changes in gross domestic product in recent decades? Our analyses of numerous countries suggest that quite different conditions prevail in manufacturing, travel, and household energy services (Howarth et al., 1993; Schipper et al., 1992b; or Schipper et al., 1993). The calculations for manufacturing show clear, sizable declines; Japan needs only about two-thirds the primary energy services in manufacturing that it used per dollar of GDP in the 1970s (Figure 8). In travel, only the United States has maintained a lower ratio since the 1973 oil price shock (Figure 9). For household energy services, the trend was steeply upward through the 1970s for many countries including Germany (Figure 10) (Sheinbaum and Schipper, 1993). The flat
ratio for the United States and Japan suggests that efficiency gains in devices are offsetting the many upward pressures from life-style changes that we have described. Overall, we do not see the consistently declining ratios that would signal an “energy saturation” of the whole society.

A LOOK TO THE FUTURE

What broad speculations and questions may be offered about how future life-styles and policies may affect activities related to energy use in a wide range of areas?
Family, Health, Welfare, and Aging

Fertility rates have fallen below replacement in many European countries and in Japan, jeopardizing future social security. New attitudes or policies might encourage more births per adult and the maintenance of larger households in the wealthy nations. At the same time, small households might come to pervade the rest of the world. Household growth could multiply energy use more than population growth.

The aged, ill, and poor might find themselves close to each other in community-care centers or associated with nuclear families. With the former, both the total amount of conditioned space and total mobility could fall. The increased clustering of people expands the possibilities for using collective modes to provide transport or to bring services to the communities. In this view of social security, energy use drops. An alternative is that the aged will remain independent and find themselves increasingly healthy and wealthy, able to travel more, while the ill are better healed and less impoverished, with the poor and homeless made less poor and in a position to find homes. This “ideal” situation, the goal of most politicians, may be elusive for some, but if progress was made towards achieving it, individual comfort and mobility would increase, and with these, energy use as well.
Homes and Goods

Housing size in area per capita might reach a saturation point as people choose to invest marginal income in the quality of their indoor environment, not in quantity. Governments might tighten the direct and indirect subsidies for the provision of housing. Appliance holdings could also saturate, mainly for reasons of space limitations, but at present the array of electronic equipment continues to increase. The number of cars will approach the number of people who can have drivers’ licenses, so access to personal mobility may saturate. Yet, the wealthy today show no reluctance to acquire space and goods, and their behavior may simply be standard in a future society with higher incomes.

Utilization of Goods

The utilization of many household goods could likewise reach a saturation point, both because the amount of meat to refrigerate satiates and because the time consumers have to spend using devices is limited. Increasingly, sophisticated refrigerators may be quieter rather than larger, with more varied compartments. Washing and drying equipment can be “smarter” in order to treat the clothes and dishes better, and this tends to reduce energy use for washing and drying. Because the electricity use for electronics is small compared with that for space conditioning, refrigeration, or washing/drying, expanded use of electronics might not significantly raise electricity use. In most developed countries, household energy use appears likely to grow more slowly than does income. Japan could be an important exception, where growth in comfort for heating and cooling offsets improvements in efficiency, particularly as more men spend time at home and families find it more difficult to move about in congested cities and suburbs.

Paid Work

Total work may itself increase or decrease. Will we try to stimulate work in ways that reduce energy use in both manufacturing and service industries? An increased number of hours worked per working family, especially the increased participation of women, appears to have been the main source of increased per capita incomes over the last twenty years. This has led to an increased use of transport for commuting but limited the rise in free time, which is itself transport-intensive. Reduced average weekly working hours could spread employment while also reallocating free time. But fears of future economic insecurity may also stimulate workers to work more, even for lower wages. Will we limit growth in wages to lessen unemployment, thereby giving consumers less disposable income? The main issue is probably whether pressures on those active in the labor force will limit the increase in free time.
Time Use and Location

Child care or help for the aged may keep more parents and older children in their homes. However, collective provision of these services, private or public, may liberate even more hours for work or other activities outside the home. electronics (pagers, rapid access to assistance) may facilitate monitoring the care of children or the elderly. The low cost of home electronics may attract more people to increase their shopping and free time at home. But the same technologies may liberate individuals from time spent in the home. Computers and “smart homes” are likely to assume a greater role in cooking and other household chores, which will allow occupants to be gone longer while menial tasks are performed in their absence.

Opening hours for services may continue to expand in the United States and will probably be “liberated” where they are now restricted in Europe, as in Britain and Germany. The motivation will be twofold: a better utilization of scarce space in expensive urban areas; and a better utilization of the transport system outside peak hours, which now span from early morning to dinner. With service vehicles and energy-intensive express-delivery systems filling the nightly valley between the morning and evening commutes, much will change.

The cost of mobility and access cannot fail to influence where time is spent. Expensive mobility and restricted access keep people from moving about and will probably increase time spent at home even if other activities there do not change. Should mobility remain inexpensive and access widen, consumers will spend increasing amounts of free time “on the road,” somewhere other than at home or at work.

Communications

Communications technologies are permeating the house at low cost, with less wire. Traditional television will yield to electronic program selection from thousands of channels and a vast number of web sites. Wireless phones can substitute for much of the present system. Even if business travel rises, travel for services and leisure could fall as the home becomes a major focus of catalog shopping and the self-production of entertainment services.

Transit

Trends suggest continued growth roughly in proportion to income. Yet, fiscal constraints on road-building, the high real costs of providing underutilized city transit, and the questionable economics of high-speed rail in all but the most well-traveled corridors may force many more travelers to confront the real, high marginal costs of travel (Johnson, 1993). Congestion and noise concerns could lead to congestion pricing and fees to reduce traffic into, through, and within very
built-up areas. Air pollution could restrict travel, and becomes a powerful reason in many cities to raise taxes on both dirty fuels and dirty vehicles. Telecommunications could become a widely accepted alternative to travel for shopping, services, and certain businesses and work, although those today with the best and most heavily used communication networks appear to travel more rather than less.

Land Use

Settlement patterns do not appear headed toward the kind of clustering that will produce significant changes in travel time or less energy-intensive modes. Greater residential densities in cities may decrease commuting and travel, or at least permit greater use of collective modes, including walking and biking (New Scientist, 1993). However, settlements will not become denser than they are today without major changes in the way land is valued and taxed. In Europe the suburbs are growing in population, and North Americans stubbornly decline to move toward large city centers, filamenting instead in “edge cities” (Garreau, 1991). Will we tax new land developments to pay for services, possibly discouraging such sprawl?

Leisure Services and Holiday Travel

Several trends point toward an increase in free time for many people. But will they spend it in commercial services (spectator sports, shopping), in nature (walking, exercising), or in long-distance holiday travel? Higher real incomes could mean increasing the “commodification” of free time. Individuals could buy more services at health clubs, more vacations, more entries to museums, concerts, and other events “elsewhere.” These demands increase the need for built space and travel and reduce time spent at home. Even “nature” means travel from one’s residence in a city or suburb toward the outdoors, increasingly distant from areas developed for homes, services, industry, or agriculture.

In a counter scenario, restricted income growth could mean consumers “do it themselves”: gardening, building, and relying on informal, local opportunities for business services and bartered or free services. Environmental concerns could limit both the expansion of leisure developments in “holiday areas” as well as increased access to these areas by hordes of tourists, each trying to get away from the other. Income growth and increasingly cheap travel could contribute to “congestion” of free-time activities and areas, but this development may simply bring new development of leisure and holiday sites throughout the world.

Personal Security

Insecurity, driven by crime, confines people to familiar neighborhoods.
People may stay at home more, using inexpensive electronics for security. Travel would then fall, with its related energy use declining by a far greater amount than the increases for security systems, home comfort, and convenience will demand.

**CONCLUDING REFLECTIONS**

So far, consumer activities have meant increases in energy use worldwide. In the advanced industrialized nations, such increases have occurred for a long period at a more rapid rate than income growth; however, in recent years, the rate of increase in energy use has grown at a somewhat less rapid rate, as the saturation of certain activities may have taken place. Income-driven life-style changes during the last decades have raised energy use especially for comfort and mobility.

In the formerly planned economies, housing and service-sector comforts will expand greatly as the socialist housing system is replaced. In this case, much of the resulting increase in energy use will offset the one-time savings that appear because of the elimination of earlier senseless overproduction and the circuitous shipping of raw materials. Still, the overall energy intensity of these economies is likely to fall.

In the less-developed countries, income growth should increase demand for all energy services. Improved industrial performance in these countries means greater energy efficiency, but output is likely to increase rapidly. This will allow urban consumers with income to buy increasingly affordable household goods. Indoor comfort increases, and, with growing mechanized mobility, personal mobility will also rise. The reforming and industrializing countries appear to be on much the same track as today’s wealthier countries.

In all countries income development matters profoundly; it affects our ability to choose what we in fact do. Other factors hard to forecast also matter. Future levels of mobility may create most uncertainty. Large variations exist even now among relatively similar countries, and it is easy to envision a wide range of travel demand in the future, depending partly on direct costs but at least equally on a host of life-style choices that affect where and how often we move about and why. While a low-mobility future is neither likely nor desirable, it is probable that wealthy countries will take steps to confront users of their transport systems with the real costs of movement and will search aggressively for more environmentally compatible transport systems in the light of likely future growth.

In the absence of information on the efficiency with which primary energy is converted into final energy services to the consumer, it is impossible to conclude that the future will be more or less energy-intensive because of the evolution of consumer life-styles alone. Also, without information on how cleanly energy is generated, we cannot say how life-styles will affect the total environment. Still, we can see from the case of energy that, in the end, consumers and their life-styles arbitrate the quality of the human environment in myriad ways. The driver’s license may matter as much as the dynamo.
1. Zahavi et al. (1981) claimed a law of constant travel time according to which people on average spend about one hour per day traveling. If true, the distance they travel will increase with speed, particularly when they switch from collective modes to individual cars or motorcycles. The time-budget surveys we have reviewed indicate a slow growth in the time spent traveling. Moreover, vacation travel is almost always excluded from the time-use studies. Because vacation travel appears to be increasing, we surmise that people are spending more time traveling as well as moving faster.

2. The periodic debates in the United States over small gasoline taxes (1–2 cents/mile) suggest that cost-based pricing and incorporation of externalities are not likely to occur soon in that country, but sentiments for such instruments are stronger in Europe.

REFERENCES