Lifestyles and Energy Use: Are Eco-Pioneers Different from Mr. and Mrs. Average?

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ABSTRACT

In September 1998 a new shopping Mall entirely devoted to eco-products has opened near Stuttgart, Germany. This Mall, unique in Germany if not in the world, has the motto: "Purchasing, working and living ecologically – and all under one roof". It offers a broad variety of eco-products in more than 20 businesses and there are dwellings for approximately 100 people located on the site, a former industrial mill. The paper investigates the ecological motivations and the consumption habits of the persons living there and compares them to those of average consumers. Thereby both "strategic" consumption decisions such as the purchase of dwellings, cars and appliances and day-to-day consumption choices like food and travel mode are analysed with a particular focus on the energy implications.

Two major research questions are analysed in particular: Are the people living and working in the eco-center significantly different from the average population as far as their attitudes towards the environment in particular and their value orientation in general are concerned? And are the consumption choices of the habitants in accordance with their attitudes and internally consistent? Are they practising environmentally friendly and energy saving behaviour in all domains, or are they showing eco-behaviour only in some visible and "low-cost" fields such as waste separation, whereas they behave as the average in fields like mobility and travel? The empirical results show that the environment related attitudes are significantly different from the general population but indicate also that even among those eco-pioneers some consumption patterns are rather conventional, particularly in the mobility field.

Introduction

The role of lifestyles for energy consumption has been explored in several studies over the last years (among others: Lutzenhiser & Hackett 1993; Prose & Wortmann 1991; Schipper et al. 1989; Weber 1999; Weber & Perrels 2000; Wilhite & Shove 1999). However most analyses either focus on the impact of socio-economic characteristics like age, household size and income on the different aspects of household energy use, including often both direct and indirect effects. Or they investigate the role of attitudes and lifestyles but limit themselves to some selected energy related consumption patterns (or even just behavioural intentions). Furthermore most studies so far investigate representative population samples – with the opportunity to draw general conclusions but not allowing to identify and analyse in depth particular pioneering groups, who may play an important role in the move towards less

energy intensive and more sustainable consumption patterns(an exception is Wolven 1991). The research presented in the following aims at bridging this gap by analysing in detail a group of citizens strongly involved in a major German project aiming at sustainable consumption. This "Ökozentrum Rommelmühle" is a shopping Mall entirely devoted to eco-products which has opened near Stuttgart, Germany in September 1998. This Mall, unique in Germany if not in the world, has the leitmotiv: "Purchasing, working and living ecologically – and all under one roof". It offers a broad variety of eco-products in more than 20 businesses and there are dwellings for approximately 100 people located on the site, a former industrial mill.

Through empirical surveys among the residents, employees and clients of this eco-center, we have investigated the attitudes and consumption patterns of the major actors involved in this challenging social experiment. The residents and the employees have committed themselves through their choice of dwelling or/and employment particularly to the eco-center. Therefore the research focus is on these two groups and their mode of living (or lifestyle in a broad sense) and compared to previous research on reference groups taken from the general population[1]. A brief sketch of the methodological approach is followed by an analysis of the socio-economic and attitudinal aspects of the lifestyle of the sample. After a review of "typical eco-behaviours" we focus on dwellings and mobility patterns, which account together for about 60% of total direct and indirect energy use of households in Germany (cf. Weber 1999).

Methodological Approach

Based on previous research, standardised questionnaires were developed for the different actors. As indicated above, the investigations focused on the persons who are involved in the eco-center for a longer time period. These are on the one hand the residents who are living in 35 dwellings. On the other hand we looked at the 161 employees working in the Shopping Mall (see: Table 1).

The investigations started at the end of April 1999 for the residents and in June 1999 for the employees. Prior to the questionnaires every potential participant, i. e. all residents and employees, received a letter with preliminary information, in which we introduced the project and assured them of their anonymity. Standardised questionnaires were handed out to the residents and employees. The questionnaires were collected two weeks later. After two weeks, people who did not respond to the questionnaire were contacted personally several times in order to improve the response rate[2].

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[1] Unfortunately there is no reference study on a representative sample of the German population which covers all the fields analysed in our research. Available data and studies either focus on factual behaviour and socio-demographics (notably the official statistical data) or they provide much detail about environmental attitudes, value orientations etc. but only a few items on factual behaviour. Therefore we use reference groups taken from various sources for our comparisons. This makes also an attribution of the observed differences in behaviour to either socio-demographics or environmental attitudes or the infrastructure of the eco-center difficult.

[2] Given that each questionnaire had between eight and twelve pages the obtained response rates have to be considered as rather satisfactory. Some non-response bias is possible but we see no possibility to control for this effect.

Table 1. Samples

	Population	Respondents	Response rate
Residents – Households	35	23	66 %
Residents – Persons aged 15 and more	74	42	56 %
Employees[3]	161	79	49 %

For the residents some questions concerned each person individually, whereas other questions were related to the household as a whole. Therefore each household received two types of questionnaires. The first one contained individual-specific questions and was expected to be filled out by every resident with an age of 15 years or older. The second one included other, household-related questions and had to be answered by one adult person per household.

The household questionnaire aimed at information on household decisions like choice of dwelling, as well as on household equipment with cars, appliances and other durables and household consumption, such as energy consumed, kilometres travelled, holiday trips etc.

In the individual questionnaire the focus was on personal attitudes and behaviour, including aspects like community-feeling, reflection of demand, general value orientation, specific attitudes, typical environmental behaviour, mobility patterns and individual socio-economic data (age, gender).

Since for the employees mostly only one person per household works at the eco-center[4], only one questionnaire was distributed. It focused on the topic "work and mobility" but also items on general preferences and environmental behaviour were included, to give the possibility for comparisons with the residents.

Socio-Economic Characteristics

Before investigating the environmental behaviour and attitudes a brief glance at the socio-economic characteristics of the samples is instructive.

The households of the *residents* have an average size of 3.2 persons. They are hence considerably larger than the German average (2.2 persons per household). Two out of three households are families with children. The one- and two-person-households are underrepresented in comparison to the German average (see: Table 2).

The average net income of the investigated Households (6,400 DM p. month) is considerably higher than the net income of the German average (3,700 DM p. month) (see: Table 2). This goes along with the fact that the residents are educated better than average. Fifty percent of the residents have a university-degree in comparison to 10% on average in Germany. This over-representation of higher education level and higher income is due to the fact that most dwellings are owner-occupied. Given that the average price for a dwelling is

[3] Ten percent of the respondents are in fact shop owners. For simplicity the term employee is yet used also for them. Given the small size of this group no separate statistical analysis has been performed.

[4] At the time of the survey only three persons lived in the Eco-center and also worked there. In the mean time this number has increased to about 10. Most of these are part-time employed women. Since the residents have been interviewed first, the persons being both residents and employees answered the questionnaires for residents, if any.

Table 2. Socio-Economic Data

	Unit	Residents	Employees	Reference group[a]
Household-size Average	Persons	3.2* *	2.9* *	2.2
1-Person-Households	%	9* *	13* *	35
2-Person-Households	%	26* *	32* *	33
More-Person-Households	%	65* *	56* *	32
Net household income per month	DM[5]	6,400* *	4,200	3,700
Education				
High school degree	%	27* *	22	18
University degree	%	49* *	16	10
Gender				
Male	%	50	31*	48[b]
Female	%	50	62*	52[b]
Profession:				
Shop-owner/ Self-employed	%	24* *	15* *	5
Civil Servant	%	5* *	0* *	4
Employee	%	52* *	65* *	24
Worker	%	0* *	6* *	19
Trainee	%	2* *	3* *	2
Non-earning[c]	%	14* *	4* *	39

[a] General population, source: (Statistisches Bundesamt 1998)
[b] Population over 15 years
[c] non-earning persons include unemployed, housemen/-wives, pupils, students and retired persons
* Significant difference compared to the reference group according to t-test respχ^2-test at the 5 %-level
* * Significant difference compared to the reference group according to t-test respχ^2-test at the 1 %-level

600,000 DM clearly only households of a certain wealth can afford property at the eco-center.

For the *employees* particularly, the high percentage of women (62%) should be noted. This is certainly related to the generally high percentage of female employees in the retail of consumption goods which accounts for 52% of the shops located in the shopping Mall[6].

As for the residents, the employees are found to have a higher education (36% have a University-degree) and a higher net income per household per month (4,200 DM) than the German average and also the average household size is with 2.9 persons above average. However only the latter difference is statistically significant. So this group of eco-pioneers confirms to a certain extent the sometimes expressed prejudice that environmental awareness is particularly a matter of the better educated and better off.

General Value Orientations

[5] The average exchange rate in 1999 was: 1 DM = 0.545 U$

[6] That women are in general more inclined to respond to surveys than men could partly also explain the observed gender distribution. However in the case of the residents no response bias linked to gender was observed.

Concerning the general value orientations, a differentiation in promaterial and postmaterial orientations is made, following Scherhorn et al. 1997 (who take in turn up the concepts put forward first by Inglehart 1977). Scherhorn et al. operationalise these orientations by relating them to the concept of "nature compatibility", "social compatibility" and "commodity fixation" of lifestyles: An individual with a postmaterial orientation appreciates nonmaterial fulfillment, which he or she does not want to give up for more material welfare. He is hence not fixated on commodities and his lifestyle is expected to be more compatible with nature and social requirements (Scherhorn et al. 1997).

On the contrary the promaterial individual derives self-esteem from material goods and a high status in society. Hence such an individual is characterised by a high commodity fixation and a low nature and social compatibility.

Promaterialism and postmaterialism were investigated using a previously developed battery of items (Seibold 1997). The battery consists of 35 statements, which the employees and residents had to evaluate. They had to mark on a scale from 1 to 6 whether the statement applies (=6) or does not apply (=1).

Table 3. Value Orientations

	Residents	Employees	Reference group[a]
Average of the answers on a scale from 1=does not apply to 6= applies			
Nature compatibility	5.00* *	4.76* *	3.45
Social compatibility	4.60* *	4.50* *	3.51
Commodity fixation	2.75* *	2.86* *	3.49

[a] a large sample from different population groups (persons in adult formation, intersted citizens, elderly people, cf. Scherhorn et al. 1997)

* *Difference to the mean of the reference group is statistically significant at the 1 % level

The results in Table 3 show that residents and employees have a considerably higher score for nature compatibility and social compatibility and a somewhat lower score for commodity fixation. Hence their lifestyles as expressed through these items are more postmaterial and less promaterial than those of the average population. But what are the implications for energy consumption and environmental degradation? This is investigated below.

Typical Eco-Behaviour

There is no way to analyse all environment or energy-related consumption decisions with an effort acceptable for both interviewees and interviewers. Therefore we decided to look at some behaviour patterns that are usually considered environmentally friendly in Germany. We also investigated in more detail consumption patterns in the following areas:

- Construction and Living
- Food
- Other goods for the daily consumption
- Vacation and free time
- Mobility

For the investigation of typical eco-friendly consumption- and behavioural – patterns 12 items have been chosen (see: Table 4).

Table 4. Typical Eco-Friendly Behaviour

Eco-friendly behaviour	Residents	Employees	Reference group[a]
Average of the answers in a scale from 1=never to 6=always			
Using recycled paper	4.86* *	4.68*	4.49
Using biologically degradable washing powder	4.95* *	4.71*	4.47
Using public transport	3.48	2.89* *	3.60
Saving Water	4.67	4.76* *	4.44
No consumption of Beverages in cans	5.05	4.96* *	4.58
Using own Handbag for shopping	5.79* *	5.51	5.31
Consuming ecological food	4.54* *	4.07* *	3.28
Avoiding to use the car for short trips	4.45	3.94*	4.27
Donation to environmental organisations	2.95* *	2.30* *	1.95
Purchasing clothes that are produced environmental-friendly	3.57* *	3.37* *	2.62
Leave package in store	2.95	3.37*	3.00
Using refills	4.50	4.34	4.35
Average	**4.31****	**4.07****	**3.86**

[a] a large sample from different population groups (persons in adult formation, interested citizens, elderly people, cf. Scherhorn et al. 1997)

* Difference to the mean of the reference group is statistically significant at the 5 % level

* * Difference to the mean of the reference group is statistically significant at the 1 % level

The results indicate that residents (average of 4.31) have a more eco-friendly behaviour than the employees (average of 4.07, difference is significant at the 5 % level). However they are both significantly more eco-friendly than the general population (average of 3.86 – see: Table 4). Yet substantial differences between items can be observed. E. g. the use of cars for short trips does not differ much between the different groups, even the employees use the car significantly more often than the average population does. So here first inconsistencies in environmentally friendly behavioural patterns appear. Whether these are relevant for energy use is investigated in the following for the fields construction and heating, car mobility and vacations. The last category is treated separately here since it is one of the fastest growing segments of German consumption.

Construction and Heating

Asking for the motives for moving to the eco-center, one may distinguish ecological and other motives[7]. As shown in Figure 1, the most important reason for moving to the eco-center has been the attractiveness of the dwellings. Further important reasons were the lovely landscape, the ecological construction style, the proximity to the working place, the energy concept and the cohabitation with people with similar interests. Hence the residents have not been solely motivated by ecological reasons but neither they have been purely driven by the

[7] We focus on attractive features of the eco-center compared to other higher standard dwellings given that most residents are dwelling owners and that they would probably have purchased another attractive home if they had not opted for the eco-center.

attractiveness of the site. Decisive has been the total package of ecology and attractiveness. This is an indication that, despite general post-material value orientations in specific decision situations material aspects still play an important and potentially also ecologically relevant role.

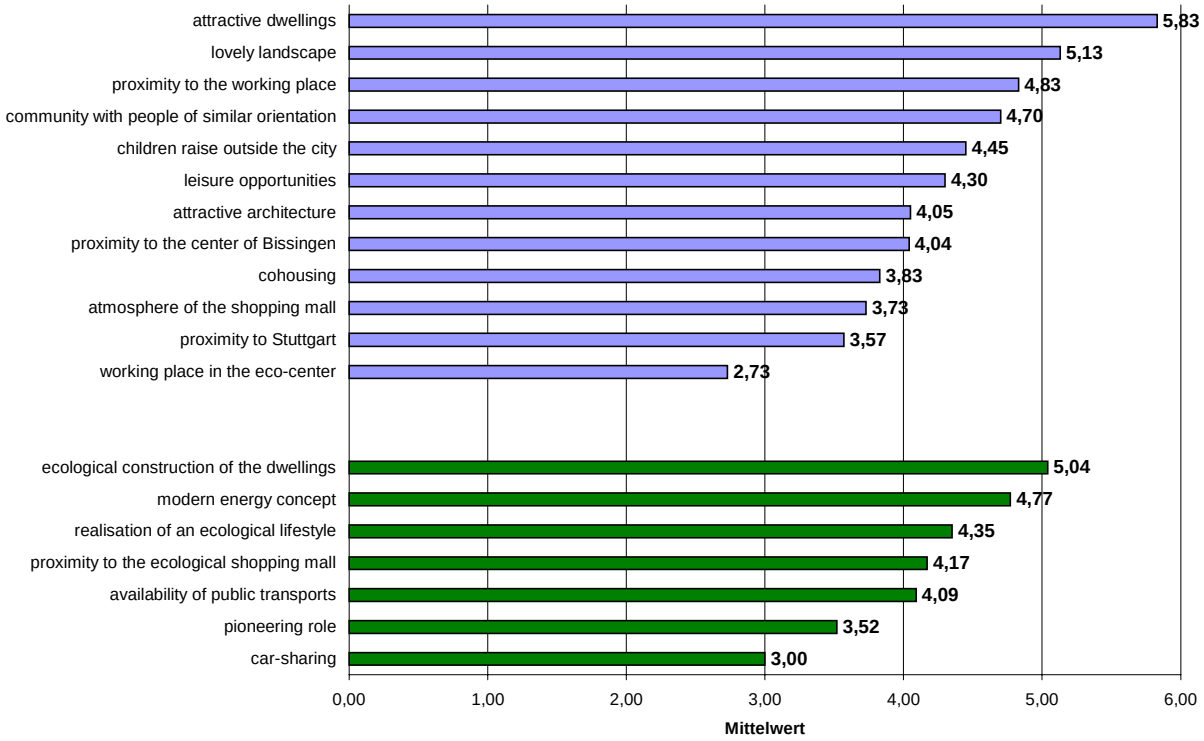

Figure 1. Reasons for Choosing the Eco-Center as New Residence.

The implications for heating energy use are so far not measurable since the housing company will only come up with figures on the energy consumption for the first 15 months of operation by end of March. But already now some conjectures may be drawn:

The average dwelling size in the sample of residents is 142 m^2, i. e. 44 m^2 per person. Compared to the German average this is considerably higher in absolute terms (reference: 84 m^2) and still some 15 % higher on per square meter (38 m^2). This average dwelling size has increased by 30 m^2 for the residents when they moved into the eco-center from their previous dwellings.

On the other hand the insulation standard of the dwellings is considerably higher than the German average and the dwellings are part of rather compact buildings, so that heat losses are minimised and despite above-average dwelling size, energy consumption probably is below average. This holds even if the higher energy consumption for the construction of the better insulated dwellings is accounted for, as several studies on cumulated energy requirements for buildings have shown.

Mobility

The share of mobility in total energy use has been steadily increasing in Germany during the last years. Despite particularly strong growth in goods traffic and company traffic still the major part of energy use is due to the mobility of private households. Therefore it is of particular interest to look at the behavioural patterns of the actors in the eco-center. Furthermore mobility is often perceived as an inconsistent field in otherwise ecologically oriented living modes (cf. e. g. Diekmann & Preisendörfer 1992).

As a first step we investigated the importance of traffic-related reasons for moving to the eco-center or accepting a job offered there. Table 5 shows the influence of the traffic alternatives offered on these decisions. The connection of the Shopping Mall to the public transport did have an influence on the decision of the residents. The influence of the Car-pool was not very high on the contrary. For the Employees the alternatives did not have a big influence.

Table 5. Reasons for the Decision to Move into the Shopping Mall or to accept a Job Offer

			Residents	Employees
Answers on a scale from 1=totally unimportant to 6=very important				
Connection to public transport				
Rating:	1 or 2	%	26	40
	3 or 4	%	22	31
	5 or 6	%	52	29
Car-pool				
Rating:	1 or 2	%	44	63
	3 or 4	%	43	29
	5 or 6	%	13	8

These results go along with car equipment rates of above 90% (see: Table 6). Almost every household owns a car, as opposed to the German average where one household out of four does not have a car. Also the average number of cars per household is above average. However this has to been seen in the light of the above average household size: The car-availability per person is comparable to the German average, 0.45 cars per person for the residents, 0.51 for the employees as compared to 0.46 cars per person in German average

Looking at the distances travelled by the residents and employees per year, a large difference between those two groups appears. The employees (18.200 km/car) are driving much more than the average in Germany (14.200 km/car). The residents (15.900 Km/car) are driving less than the employees but still more than the average. (see: Table 6).

Hence particularly for the employees mobility patterns seem to be inconsistent with the general ecological orientation. The residents are well-equipped with cars but they do not use them more than average. Further investigations have shown that, especially for commuting, significant differences between the groups appear. Both for residents and employees cars are the most important traffic means for commuting. Yet 19% of the residents have the possibility to go by foot to their job (although less than 10 % are working in the eco-center itself), which is above the German average of 11 %. This explains why they do not use the car

Table 6. Car-Availability and Distances

	Unit	Residents	Employees	Reference group
Population				
Households without car	%	9	4	26[a]
Car-availability in households with a car	cars/HH	1,14	1,35	1,15[a]
Car-availability per person of 18 years and more in households with a car	cars/person	0,67	0,67	-
Distances				
Car-distances	km/car	15.900	18.200	14.200[b]
Car-distances per person with a car	km/person	10.180	11.370	-

[a] all Households in West Germany (Statistisches Bundesamt 1999)
[b] all German cars (DIW 1998)

(55%) as often as the German average (60%) for commuting. On the contrary the employees use the car more frequently (68 %).

An additional question was asked to the employees on their driving distance to the eco-center. It turned out that 47% of the employees have to drive 10-25 kilometres to get to the Mall. Comparing to the German average, where 55% have to drive less than 10 kilometres and only 29% have to drive 10-25 kilometres, this points at a reason for the car-preference of the employees when commuting.

Looking at the energy consumption and related air-borne emissions, detailed calculations based on vehicle type, motor fuel consumption and emission reduction concepts have lead to the results shown in Table 7. On average every resident has consumed 296 l of gasoline and 93 l of Diesel. Total motor fuel consumption is about 20 % below the average of the reference group due to smaller and more efficient engines. However the residents consume more Diesel than the reference group. On average every resident has emitted 1,028 kg CO_2, 1.7 kg NO_x and 0.8 kg NMVOC. These emissions are again lower than those of the reference group, partly due to the lower motor fuel consumption, but in the case of NO_x and NMVOC also due to a relatively new car fleet with modern emission abatement technologies. Fifty percent of the cars fulfill the newest emission standard EURO III in vigour.

Table 7. Motor Fuel Consumption and Related Airborne Emissions

	Per Person				
	Gasoline	**Diesel**	**CO_2**	**NO_x**	**NMVOC**
Residents	296 *l*	93 *l*	1,028 kg	1.7 kg	0.8 kg
Reference group[a]	440 *l*	84 *l*	1,306 kg	2.8 kg	1.2 kg

[a] own calculations following (Krüger et al. 2000) for Baden-Württemberg, the federal state where the eco-center is located.

Vacations

Tourism has become a more and more important economical factor during the last decades. Especially the Germans seem to be the “Travelling-World Champion”. This is

proofed by the continuously raising travel-intensity[8] during the last years (F.U.R. 1998). Hence also this field is potentially source of inconsistent behaviour.

The investigations showed that indeed as far as travel intensity and travel frequency are concerned, the residents and employees are not acting as ecological as the German average. The travel-intensity is 100% for the residents, which means that every resident has taken at least one vacation during the last year. The employees show a travel-intensity of 79%. Both, residents and employees top the intensity of the German average (74%). Among those having travelled, the travel-frequency measures the average number of trips. The residents go on vacation 1.48 times a year and the employees 1.67 times a year. Again this is above the German average of 1.32 times a year (see: Table 8).

Table 8. Vacations

	Unit	Residents	Employees	F.U.R. [a]
Travel-intensity	%	100	79	74
Travel-frequency	Trips / HH	1.48	1.67	1.32
Place of Vacation				
Germany	%	24	21	31
Southern Europe	%	24	20	26
Rest of Europe	%	32	21	22
Overseas countries	%	6	17	14

[a] German population of 14 years and more (F.U.R. 1998).

For the transport mode (see: Figure 1) one finds, that the residents do not use the car as often as the German average does. Furthermore, they do not fly as often because they do not go to overseas countries as frequently as the average German citizen. The employees vacation more often in overseas countries than the residents. In comparison to the German average they have nearly the same modal split. In all samples the car is the most favoured transport-alternative, followed by plane and bus.

In consequence, at least for the residents, despite a higher travel intensity and frequency the energy consumption and air-borne emissions related to vacation trips are lower than for the German average.

Final Remarks

The investigations have shown that the actors involved in the eco-center Rommelmühle indeed show a significantly above-average ecological orientation. Both in value orientations like “nature compatibility” and in standard eco-behaviour like recycling the ratings obtained by residents and employees are considerably higher than those of the German average. When it comes to the most energy-relevant fields of housing and mobility however several behavioural patterns are not particularly environmentally friendly: the dwellings are

[8] The travel-intensity indicates the share of the population which makes vacations that last longer than at least 4 days.

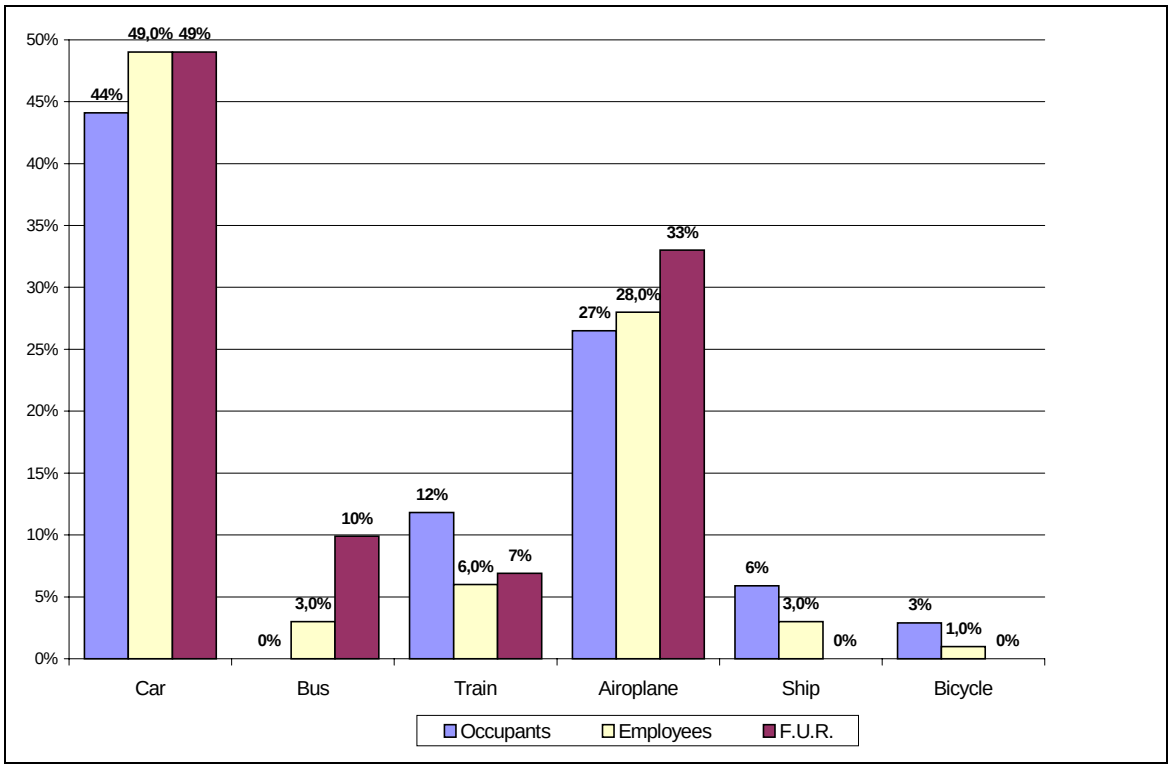

Figure 2. Travel Mode for Vacation Trips

larger than average and also the equipment with cars and the frequency of vacation trips are higher than average. These are consumption patterns which seem typical for the well-situated socio-economic class overrepresented in the eco-center.

However these high consumption levels are at least partly compensated by higher efficiency equipment leading to overall energy uses which are comparable or even lower than those of Mr and Mrs Average. These findings may be interpreted as showing the necessity of both energy- and eco-efficient products and some self-containment for the achievement of more energy-efficient and sustainable lifestyles.

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