Sacramento Car-Pool Project: Interim Evaluation Report

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This paper describes and evaluates a government program whose purpose is to obtain knowledge about and demonstrate the practicality of car pooling as a means of conserving fuel, improving air quality, and reducing transportation costs by better use of vehicles and existing transportation facilities. The program accomplishes this purpose by promoting the voluntary formation of car pools. The paper also addresses (a) the public benefits that result from car-pool matching projects, (b) the dollar benefits to participants in such projects, and (c) the costs to provide the benefits. Many insights into the conditions, practices, and natures of participants that lead to successful car-pooling efforts are furnished, and a conclusion is reached that a cost-benefit ratio of 14.7:1 can be achieved.

How can governmental agencies improve transportation? One way is to decrease the amount of traffic on the road by moving the same number of persons in fewer vehicles. This process of increasing the average vehicle occupancies can be accomplished in many ways. Some examples include exclusive bus and car-pool lanes, preferential treatment for parking facilities, priority entrances at freeway on-ramps, higher gasoline prices, rationing, and flexible working hours. One governmental program that increases vehicle occupancy rates on a voluntary basis is a matching service that lists or matches neighboring commuters to assist them in joining car pools. The Sacramento Car-Pool Project initiated such a matching service on July 1, 1974.

The purpose of this paper is to describe the results of the first 8 months of the Sacramento project. The evaluation addresses three basic questions.

1. What are the public benefits that result from car-pool matching projects?
2. What are the dollar benefits to participants in such projects?
3. What does it cost to provide the benefits?

Findings about factors that contribute to the successful implementation of areawide car-pool matching projects are also documented.

The basic purposes of the project are to obtain knowledge and demonstrate practices related to conservation of fuel, improvement of air quality, and reduction of transportation costs by better use of vehicles and existing transportation facilities. The U.S. Department of Transportation, the California Department of Transportation, the city of Sacramento, and Sacramento County jointly initiated the Sacramento project on July 1, 1974. The effort called for an expenditure of $150 000 over an 18-month period. The county sponsored the effort by allocating $135 000 of its federal-aid urban system funds and by sharing the 10 percent matching requirements equally with the city and the state. During the first 8 months of the project $55 663 were expended.

The city and state act as consultants to the county in implementing the project: The state furnishes the matching portion of the effort, and the city implements a system of preferential parking rates in its central area parking facilities.

The project provides matching assistance through both the organizational services and dial-in programs. The organizational services element of the project is directed toward establishing a large clientele of car-pool participants by working through the larger employers of the region. This service is used to rapidly build a data base of interested persons from which matching lists can be established, and it also provides a source of names to be used in assisting those who seek help through the dial-in service.

In Sacramento, most of the large employers are associated with government. Since the state capitol is located in the central city, the headquarters offices of most state agencies are also located in the downtown area. Many federal, county, and city offices are also located in the core area. Approximately 50 000 people commute to this central area each weekday. Although the metropolitan area is comprised of approximately 750 000 people, heavy industry does not predominate. Rice, tomatoes, melons, and other agricultural products generate rapid buildups and cutbacks in the work force. Thus, this situation does not facilitate the task of creating car pools.

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Although the matching element of the organizational services provides an opportunity to rapidly build a data base, the project staff recognized that many of the persons who most needed car-pooling assistance were employees of smaller companies. Furthermore, an estimated 40 percent of the 110 000 workers of the region are employed in organizations with fewer than 200 workers. The dial-in service was established to respond to the needs of this user group. Without the use of dial-in service, it would have been impossible to establish an integrated system that provides a complete service and meets the needs of all of the potential car-pool participants of the region. Furthermore, the car-pool office, with its easily remembered telephone number (445-POOL), serves as a coordinating unit for all car-pooling, van-pooling, and bus-pooling efforts in the region, whether the pooling efforts are a part of the Sacramento project or not.

The three largest nonstate employers in the region are two air force bases and the Aerojet General Corporation. There are 18 000 people working at McClellan Air Force Base, 7 000 working at Mather Air Force Base, and 2700 working at Aerojet. The two air force bases have their own computer-matching services but frequently coordinate with the project staff in seeking poolers for special situations such as long-distance commuting.

The Sacramento project personnel assisted McClellan Air Force Base in developing their system, but research for this paper does not include data from either McClellan or Mather Air Force bases. The aerojet facility did not become a part of the Sacramento project until July 1975; thus, the results from these matching efforts are not included in this study.

ORGANIZATIONAL SERVICES

Both the organizational services and the dial-in system stimulate car pooling by soliciting prospects and by giving them the necessary information to find ride-sharing partners. The organizational services program solicits prospects indirectly through the large employers in the region. The project staff initially contacted company personnel officers who provided direct assistance or an introduction to an appropriate manager. The employers were generally cooperative since their time and money expenditures were insignificant, and the program created a sense of good will with employees. Upon employer agreement to participate in the project, the project staff supplied posters for display in prominent locations. These posters provided advance publicity for later organizational service efforts. Many firms have also given the matching service excellent advance promotion in their company newsletters.

In most cases, a company executive signs a letter addressed to all employees that is then reproduced by project staff along with appropriate informational fliers and applications for participation in the program. The applications request the name of the prospective car pooler, approximate home location, phone number, working hours, and means of commuting. These applications are distributed to all employees with the transmittal letter, and interested persons are requested to fill in the needed information and return the applications to a central collection point in the organization. The applications are then picked up by a project representative and delivered to the data processing center.

Keypunchers transcribe the information from the questionnaires onto tape for computer input. The computer then produces printed lists of prospective car poolers who have similar departure and destination points. Each prospective car pooler receives a list and is encouraged to use it to assist in forming a car pool. The computer program used is a modified version of the car-pool matching program of the Federal Highway Administration.

Since the inception of the organizational service two features have been changed. During the first few months of the project, all employees were requested to complete questionnaires whether they were interested in car pooling or not. This practice was discontinued after it became apparent that persons sincerely interested in starting car pools became discouraged when they contacted others on their matching lists who really did not care to be bothered.

The second feature that changed was the use of grid maps. At first, the maps were posted throughout employment areas. The maps divide the Sacramento area into 1.6-km (1-mile) squares. Participants were asked to provide both street address and grid coordinates on the applications. Finding the map posting locations that were easily accessible to all employees was time consuming and cumbersome. Inexperience in map reading frequently led to errors in coding. Under the current system, employees merely list major street intersections near their homes, and project personnel code the grid coordinates for machine entry. Private sector participation increased substantially after these two changes were made.

DIAL-IN SERVICE

The dial-in service was designed to make matching services available to the entire community. Access to the system is gained through phone calls by any prospective car pooler, regardless of the size or location of the car pooler's place of employment. When the potential car pooler phones the car-pool number, a receptionist completes the questionnaire and provides the names of all project participants from a master file. The file is periodically updated to show the names of people still interested in car pooling. Car-pool receptionists try to respond to dial-in requests within a maximum of three days and frequently create new car pools within a matter of hours when the need is urgent.

Sacramento has a large number of small employers dispersed throughout the metropolitan area. It would be impractical to contact each of these employers on an individual basis; therefore, various approaches were used to publicize the matching service of the project. For instance, significant but smaller work-center areas in the region were saturated with fliers and posters. Car-pool project staff appeared on news and talk show programs on radio and television. These shows provided good opportunities for promoting the dial-in service and for explaining both the community and individual benefits of car pooling.

Car-pool promotion spots were placed on three of the local radio stations with traffic airwatch programs. These programs provided commute-period traffic information directly from an airborne announcer to a large clientele. Other promotion was provided by advertisements in a local weekly newspaper and by billboard advertisements that were paid for in half by the League of Women Voters.

RESEARCH DATA

The evaluation study was begun after 6 months of project operation. At the conclusion of the study, the data were expanded to cover the first 8 months of operation. The primary purpose was to measure the goals achieved, fuel conserved, air quality improved, and transportation costs reduced. As each goal element corresponds to

vehicle-kilometer (vehicle-mile) reduction, it was necessary to determine the number of vehicle-kilometers (vehicle-miles) that were reduced by car pooling. Also required was the percentage of prospects who formed car pools as a result of project efforts. These data were obtained by interviewing the persons who applied for the matching service.

At the time of the survey, there were 5083 names in the organizational services data base. Standard statistical methods indicated that a sample size of 754 interviewees was appropriate for this population. It was assumed that 15 percent of the applicants had joined car pools. A random process was used to select the actual interviewees, and interviewers contacted approximately 84 percent of the sample population. At the end of the 8-month period, the organizational services data base had grown to 6225 prospects. Survey findings were extrapolated to this number.

After 6 months, 573 prospects had contacted the program through the dial-in service. The prospects who were supplied names of potential ride-sharing partners through dial-in were requested to inform the car-pool office of their successes in forming car pools. Consequently, it was known that 254 of the 573 callers had formed car pools, a success rate of 44 percent. Of the 254 successful applicants, 92 applicants (36 percent) were interviewed as a sample population. At the end of 8 months, 372 of 998 dial-in prospects or 37 percent of the applicants had been placed in car pools.

Table 1 gives the data from these interviews. The most significant items of information are described below.

1. Of those interviewed, 21.8 percent were placed in car pools (37 percent from dial-in services and 19.3 percent from organizational services);
2. Of those placed, only 15.2 percent dropped out during the study period (10.9 percent from dial-in services and 18.5 percent from organizational services);
3. Those who did drop out remained in car pools for an average of 16.6 weeks before leaving the car pool (8.2 weeks for dial-in services and 20.4 weeks for organizational services), and the most common reason given for dropping out was change in work situation;
4. Weekly kilometer savings by users of the system averaged 143.2 km (89.0 miles) [187.3 km (112.4 miles) for dial-in services and 128.4 km (77.1 miles) for organizational services]; and
5. Of those interviewed, 76 percent said that their vehicles for commuting were not used on days they did not drive (72 percent for dial-in services and 78 percent for organizational services).

The other significant survey findings not given in Table 1 are

1. The trend by car poolers toward the use of smaller sized cars was 27 percent for subcompacts, 14 percent for compacts, and 59 percent for conventional sized cars;
2. Most car poolers (57 percent) had previously driven alone or were in another car pool (33 percent), but few (7 percent) were diverted from transit, i.e., Sacramento Regional Transit bus service;
3. There were 2.15 drivers and 1.98 automobiles in the households in which vehicles for commuting were idle. There were 2.41 drivers and 1.66 automobiles in the households in which vehicles for commuting were not idle; and
4. The average occupancy for each car pool was 3.2 persons.

Figure 1 shows the distribution of car pools by daily one-way commute distance. Figure 2 shows the distribution of poolers by weekly decreases (or increases) in commute-kilometers driven. An increase occurs when a car pooler who drives or shares driving was formerly a rider only or a commuter by transit.

ANALYSIS OF DATA

The data obtained were used to determine the dollar value of public benefits that resulted from the car-pool program and to measure program effectiveness. It is possible to estimate the savings to the individual consumers (the commuters who become car poolers). The savings for individual consumers are a direct function of the reduced vehicle-kilometers for their personal automobiles.

The consumer's cost of operating an automobile is 7.0 cents/km (11.2 cents/mile) for a subcompact, 8.0 cents/km (12.9 cents/mile) for a compact, and 9.9 cents/km (15.9 cents/mile) for a conventional size automobile. For the Sacramento project, these costs were adjusted to correspond to the mix of car sizes used by the surveyed car poolers. The operating cost for car poolers in the project [8.8 cents/km (14.2 cents/mile)] represents the car-pool vehicle.

The dollar value of savings to individual users is \$818 400/year [8.8 cents/km (14.2 cents/mile) × 9 300 000 km (5 766 500 miles) of reduced vehicle travel]. After establishing this value for consumer benefits, the question of cost to provide the savings was addressed. Analysis of cost-accounting records for the project indicated expenditures totaling \$55 663 for the first 8 months of the effort. The return for the first year was \$818 400; the rate of return was 1470 percent. Thus, the project has a 14.7:1 benefit to cost ratio for individual users plus an unquantifiable value of benefits to the general public.

To arrive at the 14.7:1 ratio we assumed that the life of a car pool is 1 year. This assumption appears conservative since car pools tend to perpetuate themselves; when one member drops out, the remaining members seek a replacement. It is not difficult to interest a significant proportion of commuters in car pooling. After 8 months, the dial-in service had generated 998 prospects and the organizational service had generated 6225 prospects, a total of 7223 prospects. This total is approximately 1 percent of the population of the Sacramento metropolitan region.

A significant proportion of inquiring commuters were motivated to join and stay in car pools. Overall, 21.8 percent of the prospects joined car pools (37 percent of the dial-in prospects and 19.3 percent of the organizational service prospects). There were few dropouts: Only 11 percent of the dial-in service and 18.5 percent of the organizational service customers placed in car pools discontinued car pooling. The cost to place a commuter in a car pool is low compared to the benefits derived. Of the 372 dial-in prospects (actual count) and the 1201 organizational service prospects (extrapolated), a total of 1573 were placed in car pools during the 8-month period. The total cost was \$55 663, and the cost for each prospect placed was \$35. Comparisons with other car-pool programs indicate that the \$35 placement rate is very competitive.

Benefits to the general public are given in Table 2, and a dollar value was not assigned to them. Table 2 is based on data (1) for a 1970 automobile that was the typical model according to the survey. The 14.7:1 benefit-cost ratio applies to user advantages only. The general public benefits are described in greater detail below.

1. Transportation facilities are designed to provide capacity for peak commuting periods. Any reduction in use of vehicles by commuters directly affects the traffic flow during the peak period and reduces the highway facilities needed. The car-pool project reduced the facility needs by 9 280 300 vehicle-km (5 772 346 vehicle-miles) of travel per year during peak commuting hours. There is a corresponding increase of efficient commuter traffic flow that resulted in savings of time and fuel.

2. Many of the dollars previously spent for fuel are now available for the purchase of manufactured goods, which acts to stimulate the economy. Reduced fuel import requirements help the country's balance of payments. The reduced use of fuel will prolong the life of one of our valuable natural resources.

3. Although figures for industrial and governmental costs in reducing pollutants are not readily available, it is felt that they are significant. All reductions in pollutants will help to attain state, federal, and local goals of improving air quality.

4. The use of central area land for storage of idle vehicles is not a highly productive use of the land. However, because of the parking needs generated by the commuters'

Table 1. Survey data.

Item	Dial-In Service	Organizational Service	Combined Total
Persons interviewed	92	615	707
Interviewees placed in car pools	92	119	211
Interviewees placed and later dropped out	10	22	32
Interviewees placed, percent	37	19.3	21.8
Interviewees placed and later dropped out, percent	10.9	18.5	15.2
Average length of participation for dropouts, weeks	8.2	20.4	16.6
Average one-way commute, kilometers	36.2	27.4	29.6
Commuting kilometers reduced per week per car pooler	221.6	141.8	161.9
Increased home use kilometers per week per car pooler	34.3	13.4	18.7
Net kilometers saved per car pooler	187.3	128.4	143.2
Average annual kilometer savings per car pooler[a]	8610	5905	6589
Cars idle when not used for commuting, percent	72	78	76

[a] In converting weekly kilometer savings to annual savings (46 weeks), an allowance of 6 weeks was made for vacation, sick leave, and days when automobile must be driven for personal reasons.

Figure 1. One-way distance to work.

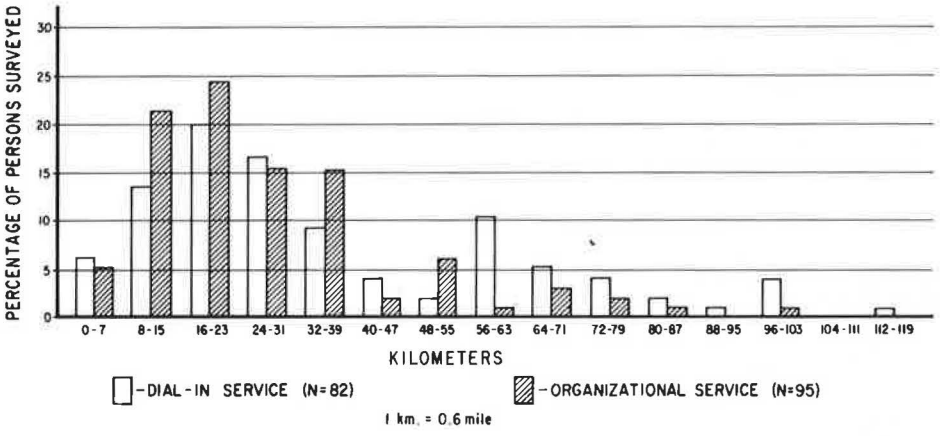

Figure 2. Difference in distance driven per week due to car pooling.

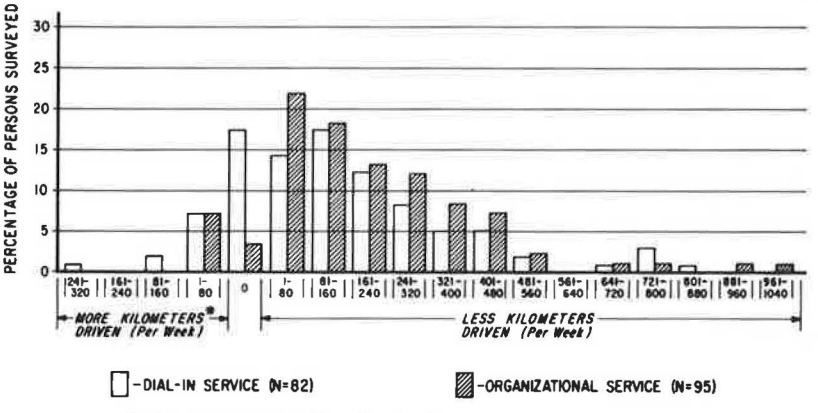

Table 2. Public benefits.

Item	Amount
Reduced travel, vehicle-km/year[a]	9 280 300
Conserved fuel, L/year[b]	1 679 200
Reduced pollutants, kg/year	
Carbon monoxide	156 900
Oxides of nitrogen	31 400
Hydrocarbons	26 200
Total	214 500
Reduced parking needs, spaces[c]	600

Note: 1 km = 0.6 mile; 1 L = 0.2 gal; and 1 kg = 2.2 lb.

[a] Extrapolated from survey results.
[b] Assuming 21 km/L.
[c] Assuming 1.3 and 3.2 persons/vehicle before and after pooling respectively.

use of automobiles, most cities have found it necessary to require property owners to provide parking for employees and customers. The parking facilities designed to economize on land use require approximately 18.6 m^2 (200 ft^2)/parking space, including driving lanes. Consequently, the reduction of 600 parking spaces created by the project is equal to 12 138 m^2 (3 acres) of expensive downtown land.

CONCLUSIONS

A number of conclusions can be drawn from the research. It is acknowledged that conditions may differ in other locales; however, we believe that the conclusions drawn may serve as guidelines for those who plan car-pool projects in other typical metropolitan regions.

1. Car-pooling projects can be used as cost-effective methods for reducing commuter transportation costs. User benefits to cost ratios of 14.7:1 are attainable.
2. Both dial-in and organizational services must be provided if all of the potential car poolers of the region are to be appropriately served.
3. Expenditures can be held to approximately $35/person placed.
4. The average person placed reduces the use of his or her personal automobile by about 6400 km (4000 miles)/year.
5. Of the commuting car poolers, 72 percent do not use their vehicles on days when they are not required for car-pool travel.
6. Most car poolers placed are taken from single-occupant vehicles (57 percent) or smaller car pools (37 percent).
7. If a good transit service is provided such as in Sacramento, a low percentage (7 percent) of new car poolers are drawn from transit.
8. A large percentage of car poolers drive small vehicles (27 percent for subcompacts, 14 percent for compacts, and 59 percent for standard size).
9. Large expenditures for advertising and other forms of promotion are not required to motivate substantial numbers of commuters to join car pools: Of the total $55 663 expended, only $4000 was spent on the promotion of car pools.

REFERENCE

1. Compilation of Air Pollutant Emission Factors. U.S. Environmental Protection Agency, Feb. 1972.