RENOVATION IN THE UNITED STATES:

POSITIVE ASPECTS AND APPLICABILITY TO SOUTHERN EUROPE

Juan Martinez
Senior Fellow
1980
While the process of deterioration of centers of United States cities that occurred between 1955-1975 was the product of complex causes in the housing market (middle class flight then replacement by racially differentiated lower class groups, etc.) in Europe it was more a product of a process of decline (aging of population, loss of competitive capacity, or in many cases excessive increase in the tertiary sector, along with environmental deterioration (noise, pollution, etc.)

In Europe the equivalent of urban renewal was carried out in the peripheries of the cities and a central redevelopment. Since this occurred in areas that had no symbolic or architectural importance, the operation was neatly carried out by private developers with the tacit support of the public sector, with a kind of "out of sight, out of mind" approach.

In the United States the operations have been dirty because everyone is watching, with the particularity that the land is sold to private promoters (for 30% of their value) to build luxury apartments and office buildings, with all kinds of tax benefits. It is difficult for us to imagine our harried local governments investing in such operations. Besides, this is being done in areas that have something of interest, be it, its centrality, the quality of the buildings or their symbolic value. This kind of intervention, generally redevelopment, along with large highways-usually characterized as "bulldozer" destroys any kind of local character that might have existed, reinforces zoning, expelling the minority groups who lived there with only minimal indemnification. Next to these black neighborhoods there are usually some old middle class areas, generally well situated with some architectural interest, and inhabited by middle class minority groups. In these areas the process of expulsion is called revitalization or conservation, and as Friedman (1964) notes, without a strong center of reference there is no hope for renovation. The other side of that hope is well expressed in the title of an article by D. Lenwood "The City Removed: White Dream - Black Nightmare".

Given the few black neighborhoods that exist in European cities, talk of redevelopment is more a developer's dream than an objective necessity. When we refer to urban renewal, we tend to think of
revitalization or conservation, and we try to refer to the experience of the second part of renovation in United States cities that we have just mentioned. Since there are no hard and fast rules for renovation, in each case the focus should be different, given the large number of factors that must be taken into account. What follows seeks to be an (uncertain) summary of the positive aspects of the American experience that can be useful within the framework of renovation in southern Europe.

The "charisma" and the magnitude of American slums and ghettos can appear at first to be the best or the first useful approximation for understanding urban renewal since we may presume that by knowing the genesis of their formation and current structure we might approach possible solutions in a more effective way. Nevertheless, I do not think that is quite right. The literature produced during the 60's and even before (Kenneth Clarke, Wirth, W. White, Liebow, and especially Herbert J. Gangs) are works of high quality, but they provide knowledge about urban sociology in general since these sectors have the peculiarity of involving social groups that are isolated because of race, ethnicity, etc., and can easily be used for studies of primary segregated communities (family, poverty etc.), group behavior with more limited physical and social limits than is the case for more integrated and complex communities. More than about problems of housing destruction and renovation. It is in the more political area, or, in academic terms, in the area of "social planning" where I think a theoretical field has been worked out, based on the initial work of Webber, Reim, Frieden, Dyckmann, or Gangs and the current contributions of Dye, Gray, Rinkin, etc.

In the former, besides developing their empirical studies, they dedicate a great deal of their energy to defining fields, objectives, semantic clarifications and a large number of the recommendations for planning that, although well known today, are nonetheless unfortunately less current.

Nevertheless, this group created a basis for discussion and principles that, without dealing with the establishment in general, developed premisses that allowed the field of "social planning" to be surprisingly developed 20 years later, covering one of the most difficult fields currently existing in sociology e.g. the evaluation of social phenomena and whether or not urban renewal is useful, as we shall see.
The phenomenon of housing abandonment in the inner cities should be approached from the perspective of various disciplines, but especially in terms of economics and ecology, more than sociology. Especially if we begin with the fact that in sociology there invasion-succession, with its higher explanatory level, is similar to the "filtering" theory which explains housing mobility in terms of fear which results from the pressure generated by low income groups and the pathology that goes with them. Middle class groups also see the depreciation of the value of their homes that are near poor neighborhoods. In general there is a physical and social pressure that goes through the housing market from bottom up and is ameliorated according to the political power of each group.

Understood broadly, this theory, versus purely ecological theories has the advantage of general theory of city planning and that this lack is often felt, we have to go back to the model established by Ernest W. Burgess of concentric circles of growth that was further developed with the introduction of the notion of "gradients" to and reached Wassion theory of the succession cycle, that is, low income groups occupying higher income areas, thus "expelling" the latter toward better areas.

Since it is better adapted to American rather than European cities, the first part of Burgess' socio-ecological model is thought better of in the U.S. than abroad where it is considered to be naive and superficial, given its low explanatory level. Nevertheless the theory of socio-economic and political factors which exist in practice to be considered. The ecological model has been built on the premiss of spontaneous process and on the non-monopoly of the land market, which is what in fact occurs.

For example, in European cities low income groups only managed to gain small areas of the city centers, and they had to build shacks on the outskirt and later move to "bedroom" neighborhoods. But even in 1925 Walter Frey analyzed a case in Boston in which groups of high standing resisted the entrance of lower income groups. Also, Wallace Smith (1966) discovered that in Los Angeles it is middle income groups that change their residence rather than high income group, just as usually occurs in Europe.
Economic growth and the mobility of supply in the housing market are factors that condition the efficiency of the process like others. It should be clear that it is the economically more powerful groups that elect the localities.

Thus, while this theory explains how revitalization and "private urban renewal" responds to the interest of middle class groups with some particular characteristics who wish to return to take over the centers of the cities, as a socially and economically preponderant group that "chooses" its place of residence, breaking with the classical theory of Burgess or with the invasion succession cycle which is generally supported by operations of a strong intervention or redevelopment in those areas of lower quality in the outskirts. I no not believe that it explains the formation of slums and the abandoned zones within the city which are based on a variety phenomena be they of the market, economic, regional, social, political such that the urban framework frequently is no more than a simple reflex of much more complex phenomena. According to Harvey "Problems of the built city and those of urbanism as a way of life must be considered separately since in reality they are separate."

This means that we have in front of us two different roads for controlling the deterioration and the decline of urban areas. In principle the most effective one is being able to predict and control the decay before it is produced; this is based on the perspective which comes out of economic considerations, the housing market, planning, zoning, etc. Another possibility is that once this process is begun or is in an advanced state a wide gamut of possible solutions can be used: creation of more jobs, commercial reactivation, credits, social work, etc. These means are to be complemented by other measures of the former type which are more structural and would favor the renovation of the area. Housing destruction and its pathologies are habitually explained from different and frequently controversial points of view. Previously established political positions usually influence the decision of choosing which is the determinant or crucial element in the process.
It would be necessary to study the process in each individual, real case, since it is possible that various factors may enter into play at the same time. But let's look rapidly at the most interesting hypothesis in this field.

1. The poverty hypothesis. This is a typically liberal explanation. According to it, neighborhood deterioration is the consequence of a permanent poverty which needs to incapacitate to keep up the buildings, and is made more acute by the inevitable problems of delinquency. The way of combating it would be the elimination of poverty. Although there exists a real correlation between one process and the other, this does not mean that they are based on the same thing. In other countries or in other parts of the United States, poor neighborhoods have not produced the same effects.

2. The rent gap theory. This argues that the rent permitted by rent regulations or constrained by the income of the tenants are lower than the rental income needed to maintain much of the stock. However, housing destruction has been increasing in the U.S. precisely during the period when the rent gap has been significantly reduced through the relaxation of rent regulations. Nevertheless, this theory is a factor to be taken into account frequently. In Spain, as we will see, it was a factor that had a strong impact in the deterioration of buildings, but at the same time and because of a lack of supply it saved those buildings from being destroyed.

3. The surplus housing hypothesis. The decline of demand in the housing market causes a number of buildings to become unusable. Since there are two separate markets in the U.S.A., one white and another for minorities, in this theory we can take into account the problems created by white flight into the suburbs and the incapacity of minorities to take over the abandoned stock; besides this would create a surplus demand. However, the housing destruction syndrome itself is responsible for some of the population's exodus needing to lower demands; that is, the buildings and units being destroyed are not the worst ones, and the extent and pace of destruction far exceeds the surplus of housing supply over demand.
4. The public sector assumption. This hypothesis assumes that the private housing market does not work in poor neighborhoods and, using a line of argument similar to that of the rent gap theory, the private market cannot maintain poor neighborhoods. The policy to follow is a massive intervention of the public sector, in the construction of low income housing for the poor.

   Obviously, public housing is more apt to fall in the hands of the housing destruction syndrome, and it is also probably inevitable that public housing shows signs of decay. Nevertheless, it is a possible short term solution provided that public funds are capable of undertaking it.

5. Redlining, coviolations, etc. The noninvestment in areas which border on slums, a boycott of bank loans in these areas, or the exploitative behavior of the owners of many apartment buildings. I think that this is more an effect than a cause of the process. Nevertheless, there is no evidence to the effect that those buildings which have obtained loans have had better luck in the medium term than the rest.

6. Public intervention: The massive construction of subsidized housing, rent control, and rent subsidies which allow lower classes to compete with middle classes in the housing market, thus provoking an excessive white immigration to the suburbs, an excess demand in the suburbs, and they drop in demand in the housing for the poor given the strong competition of the state. Rent subsidy also gives to the poor the option of competing in the housing market with middle income groups. Obviously this is only applicable in a specific moment in New York, or in another brief interventionist moment in another developed country when the situation has been very serious. But it can be a costly joke in the majority of cases.

   My opinion is that in large number of the mentioned hypotheses can function at the same time and that in fact to a large extent they are inter-related. In southern European countries obviously the surplus housing hypothesis or the massive state intervention are not a "threat" in the short run. But it seems important to control such state intervention, as Salina notes in his interesting book, because of the kinds of unforeseen repercussions that it can cause. In the case of New York I think it is a conjunctural exception and it does not allow us in any way to condemn globally state intervention in favor of an economic liberalism - political conservatism whose effects are more than doubtful.
We should make it clear that rehabilitation is still a minority phenomenon in the United States. The majority of U.S. cities continue to lose population to the suburbs, except in a few cases where population is maintained by substantial investment and great effort.

According to the Urban Land Institute, between 1967 and 1975, 50,000 houses were renovated in the entire United States. Obviously this cannot yet be considered to be an established tendency, which is what E. Coe (1978) claims: "Some neighborhoods are already undergoing revitalization" as those who are relatively young, relatively well to do, and childless discover that cities can be chic. In many cases such neighborhoods are becoming islands for the fortunate - and the poor and the elderly, and others on low and fixed incomes are driven elsewhere. Such shifts do not necessarily signify an urban renaissance. They do highlight an irony: that cities, or at least parts of cities, can be built up without the poor in those cities becoming any better off.

This a process which is far from being a tendency that might become consolidated, normally in the shadow of the major redevelopment businesses, and it also has social and ideological repercussions that go beyond what was expected. Almost all the studies of revitalization - which one assumes would be a more benevolent process that classical urban renewal - indicate major problems. The expulsion of the original residents blockbusting, even the expulsion of the first white middle class "pioneers" who had started the process but who are now overtaken by it.

The new residents of renovated neighborhoods are white middle class professionals who seem to be lively and dedicated neighbors; in more moderate areas what is needed are groups prepared to undertake that community leadership that is so necessary for the survival of any large metropolis. They are well educated, have substantial income, are mature, and are not overwhelmed by the cost, both in time and money, of raising children. Those people, therefore, enjoys the freedom necessary to dedicate a considerable part of their time to supporting the arts and various other community activities (quoted by Goodman 1971). This opinion is not unanimous - almost the opposite - but it is obvious that renovation presupposes investment, economic reactivation, rent and value
increases, and, therefore, the expulsion of those who are "not able" to adapt themselves to the increases.

The European housing market is more elastic and the value of a neighborhood does not go down 30% because there are 10 black families, probably because there is not such a great social problem. We still find it surprising to talk of a "tipping point" in terms of black visibility, although in Paris and London there is talk of a 6% tolerance point of immigrant residents.
Although important parts of areas in decline in Europe have been partially invaded by low income groups, they have not lost the traditional character and in part these groups have integrated themselves in these neighborhoods to the extent of their possibilities, and frequently have enriched them with a large gamut of activities.

What must be done, then, is to develop mechanisms which with a minimal demographic and environmental effect can neutralize their decline and conserve their original characteristics. This project is aimed more at revitalization than at a takeover. As is said in Bologna "conservation signifies the social reappropriation of the city" versus the market mechanisms, versus changes in use, etc.

Although southern European cities are obviously very different from American cities, its not of interest here to develop the theme of why they should be conserved nor to deal with the ideological polemic about this issue. Nevertheless, methodologically we have many basic points in common. We know very little about the internal mechanisms of the life of a city. We know that it is much easier to destroy them than to build them. We know that the new professionals who return to these cities are more consumers than generators of the internal life of the city. We know that almost all the problems that are reflected in urban areas have an exterior cause, be it economic, social, energy suspension points and that they are difficult to resolve in terms of "urbanistic" solutions. We also know that many of the urban solutions that were precipitously adopted in the last two decades of rapid urbanization have not given satisfactory results in terms of a "way of life." Both in the United States and in southern Europe there is a significant and generalized interest in urban revitalization that is held by certain groups.

Many investigations done by American urbanists have to begin almost at zero. Therefore, they've had to place much more emphasis on a wider variety of questions. If adapted conscientiously, some of the conclusions to which they have arrived can be very useful in Europe, and with better prospects for success. Since in Europe there is a greater cultural homogeneity and an urban tradition that is more or less established, whose objectives would be principally promoting and encouraging aspects of that which already exists in urban reality.
The first aspect to consider is the prediction and the evaluation of decline before population changes begin. They do not spontaneously enter or leave areas. There are some changes that precede population shifts. In all the bibliography on this question in which we can include locating theories (muth, etc.) ecological or economic theories, there are others which can be quite useful because they are easily applicable. According to Zeitz: "An examination utilizing two variables, sales activity and property price, shows that a finite number of possible patterns can emerge. Sales activity is measured by the actual number of residential transactions occurring in a given area over fixed periods of time; sales price is actual price paid. As shown in figure 7-1, utilizing these two variables we can discern four possible patterns. These two variables must be used with a degree of caution and measured against a norm. For example, sales price is closely connected to general economic trends. Thus, in inflationary periods it is anticipated that prices will rise. They should rise in accordance with inflation and can be adjusted to take inflation into account. They should rise in proportion to the "normal" sales prices in a given area. Sales activity must be measured by local activity patterns. National mobility patterns indicate that half of all American households move every five years. Obviously, cities vary in terms of mobility patterns. The District of Columbia, for example, is both the seat of the federal government and a university city. As such, it has a high rate of population mobility. Other cities may have far less population turnover than the District. What is presented as a measure of sales activity is the "normal" rate of turnover of residential housing in a particular urban area, with the recognition that local conditions will vary.

Utilizing these two variables has unique advantages: First, most cities have these data readily available. Second, this approach can be used on a census tract level, but it is not limited to that level of analysis. It can easily be reduced to a block level of analysis as well. These two variables can, by no means, explain what is changing or why change is taking place beyond the dimensions of their own definitions. However, they can be utilized to signal where change is taking place, and they can be applied at continuous intervals. For example, if sales activity is down or stable and prices are
high and static, no change is going on in the area. This is based on the assumption that sales activity in the area approximates the citywide activity pattern, and that prices are adjusted for inflation. The same holds for the three other patterns; that is, activity down and price down may be the signal that an area is in the process of deterioration. Activity up and price static or down may be indicative of an area about to improve. Increased sales activity without price change may show that speculative buying is occurring in anticipation of area change. When activity is up and sales price is up as well, the area may be rapidly improving.

<table>
<thead>
<tr>
<th>++</th>
<th>+-</th>
</tr>
</thead>
<tbody>
<tr>
<td>+-</td>
<td>--</td>
</tr>
</tbody>
</table>

+++ = Sales activity up - Prices up
+-- = Sales activity up - Prices down
++- = Sales activity down - Prices up
--- = Sales activity down - Prices down

Figure 7-1. Urban Residential Change Indicators

A second theory that is quite interesting is the hypothesis developed by Baumol (1963) according to which the drop in incomes in inner cities tends to become cumulative in a process of decline. Utilizing first degree differential equations he relates a first hypothesis, that decay affects the income level per capita, with a second equation that decay increases the rate of income discrimination.

We can identify a stable case and an unstable case. In diagram 2 they are represented by the curves Fs Y+ and Fu Y+ respectively. In the unstable case (fu Y+), and if the per capita income falls below the critical level Yk, let's say to Yj, the cumulative deterioration becomes irreversible, unless the municipal authorities intervene (Yk > Yj). The economic conditions of the decaying inner city becomes worse, the per capita income declines (Y1, Y2), and the income declines along the line ABC. In the stable case (Fs Y), below Y0 per capita income declines, but within fixed limits, Y+ approaches asymptotically the lower limit Yk but it never falls below this level.
This theory which is more related to systems analysis, appears to be more appropriate for detecting and preventing decay, or as a focus to use within a general strategy of planning than are cost benefit techniques. Nevertheless, I would not discard it, as Richardson recommends, since that as a project it is difficult to evaluate it with systems analysis. A.N. Schaaf (1969) presents some examples of cost analysis which are very complicated to use, but he limits them to a comparison of different interventions: redevelopment, rehabilitation, etc., but without introducing environmental element or market elements. Obviously this is the weak point of cost benefit analysis: the difficulty of separating the effects of transfer payments from any possible gain in real income; the difficulty of evaluating anything beyond the area dealt with and especially measuring social and environmental improvements that are difficult to calculate.
J. Rothenberg (1967) makes a serious attempt at such an evaluation, but he recognizes the difficulty of evaluating the contagion effect or the decline of social cost (+ or -).

As I have said before, on this point there is a whole field developed, "social planning," which has perfected a technique for social evaluation which may possibly be adapted to other disciplines, perhaps by means of path analysis (as in the case of the studies of Lewis-Beck, e.g.) although this is still in a developing phase, especially in sociology. In conclusion, then, I would choose two first techniques which are useful for the evaluation and prevention of decline in a specific area. In the third as an evaluation of different interventions to be developed in a specifically detected area. Naturally, the latter is a hypothesis which must be proved and practiced.

At the level of concrete intervention the objectives and goals tend to be very optimistic: it is the moment to speak about the recreated and replenished life of the citizens. We need to note, as Herbert J. Gangs observed in 1964, that changes in planning are not going to resolve the problems of the residents of an area. Conditions of life which at first glance appear to be the effects of urbanization frequently turn out to be the effects of industrialization. In recent years many researchers have tried to discover physical patterns, but these are really difficult to establish because their reading is almost inseparable from social and cultural models of organization. The physical environment has an important meaning, but its influence is modified according to external causes. In this matter we are in agreement with writers from Castells, in his question urbaine, to Jane Jacob, who has written on the subject with greater intuition than, for example, manuals such as the one by S. Veller, and Lynch, or even Robert Venture, in spite of his culturalist approach to the theme.

On the other hand, as we have said in Europe the urban traditions are different: plazas, street, the center, cafes as places of exchange, not simply economic exchange but also of an exchange of information and of other relations of various sorts. There is a deterioration of this kind of culture
that is not a product of an urban deterioration, although at times this is suggested. Because of the survival of a tradition that is both economic and based in the population, certain aspects of culture from the beginnings of this century continue to survive. Urban rehabilitation will not be able to be a substitute for television as the most important means of communication. Older ways of life, whether we like it or not are finally dying out. It is true that in certain areas if allowed a contagion phenomena prevails. This is what gives a personality to cities; this is what revitalization can begin to achieve, but the new people that revitalization may attract will belong, even when they are the children of the current residents, primarily to a new culture and they will have new values. Careful control of these two aspects is important for carrying out a realistic approach to urban revitalization.

In this perspective, what would be the most interesting lessons that the American experience could contribute? For the moment I think it is difficult to evaluate, but we can speak of four interesting aspects to be analyzed and a generalized absence. This absence is what I have found in the studies on the level of intervention in neighborhoods; Smith and others deal with the theme tangentially. But in spite of the abundance of discussion of the need to graduate the economic and demographic degree of intervention so as not to alter abruptly the rhythms of these areas, I have not found any study that deals in depth or develops a methodology for the subject: employment, compatible groups, volume, redistribution, and frequency suspension points on the type of businesses and industries there exists the well known surveys, but these are general studies rather than studies specifically aimed at renovation. I think that there is a big vacuum in this area and not just in the United States but rather in general. In spite of speaking about the importance of the theme in the white book of England, Schaefer in Denmark, the study by Appleyard, and the Italians especially in Bologna and Venice, I have not found any developed study of the subject. The most interesting aspects of the subject are: in a first group rent control, credits and tax policies; in a second group commercial revitalization employment and economic activity; in a third group environmental impact and design, and finally social policies.

1. With respect to the first aspect, the magnitude of possibilities and of
credits that can be used can be found in any HUD manual, and they include
everything from the generous 70% subsidy for urban renewal to the loans
for slum repairs. Since legislation cannot simply be invented, the pertinent
legislation in Spain practically does not exist, while in Italy where there
is a much longer tradition such legislation has been developed since the
left parties have taken control of municipal governments, we must refer to
what exists in each case. Jan Schaefer, Alderman of Amsterdam, suggested
obtaining credits at the expense of future old age pensions, probably because
that's all there is left. The Italians on the other hand try to get all the
money from public funds.

Harold K. Bell, who has extensive experience in New York, has developed
some not too complicated models based on tax increment financing, organizing
some community operations that he calls the neighborhood trust. The neighbor-
hood trust is a mechanism to apply this financial level to the redemption and
preservation of neighborhoods and their residents. He proposes that for each
dollar of increased tax revenues to the city, brought about by middle class
acquisition and improvement, half of these dollar sums be made available to
a neighborhood trust, a non-profit entity formed within the neighborhood and
operated by and for the people of that neighborhood. The trust can borrow
against those dollars now, by pledging known and collectible future revenues,
the Y factor.

The trust would be able to capitalize its cash flow by means of a tax
exempt bond issue whose proceeds would be directed primarily to the maintenance
of the current population. This capital, upfront, makes possible capital grants
to assist in purchases, enables the neighborhood to supply necessary support
systems and plant desirable social and technical infrastructures.

This kind of solution is more interesting than others cause it allows
for the activities of groups which have considerable possibilities in cities
where property is very divided in apartments or perhaps between owners and
renters, in a case where the renters might take a genuine interest in the
operation if it were in fact a real renovation, or it even might give them
the opportunity to become owners. The economic calculations of the increase
in value of buildings done by Mr. Bell are difficult to accept for a market
which is not as rigid as in the United States. Tax increment financing has
also been used in the establishment of commercial centers, or at least in the
financing of parallel or complimentary works. The tax support system or the
middle class are also interesting, but they must be integrated into a much more complex legislation that is also difficult to obtain.

It needs to be noted that the municipal benefits and taxes that can be obtained in the United States or in northern European countries are much greater than those that are available in southern Europe where fiscal pressure is much more centralized and municipal governments have less autonomy. The effort then should be aimed at achieving variants of these forms, even using the private banking system which is much less reluctant to grant private credits in cities that is the case in the United States or in England. An additional obstacle is the frequent difficulty of limiting homogenous neighborhoods and a number of different interests that enter into play since zoning, redlining, etc. are radically different in Europe from the marked and homogenous zones in American cities which may easily assume community programs such as Southeast Development Inc. in Baltimore with aspirations of extensive planning in which the residents would control a large part of the activities and the neighborhood is a good example of such a community.

Rent control is frequently a double edged sword. In Spain the various forms that it has taken have managed to remove a large number of houses from circulation since their profitability is very low. On the other hand it has managed to have an important preserving effect, not just of population but also of buildings. If we wish to control the invasion of new elements in any area, rent control can be a good means of keeping the present residents from being expelled. On the other hand without having flexible rents it is difficult to encourage owners to invest and to rent. A liberalized policy for frozen stock together with the obligation of maintaining buildings and former renters may be a compromised solution with rapid results given the strong demand for housing.

In conclusion, the negative effects of rent control with respect to low demand may as we have seen lead to housing destruction, to critical situations in these areas which would require a strong state intervention and with other following effects that are difficult to foresee.

2. Employment, commercial revitalization. One of the most evident constants in renovation is that the unemployment rate is much higher than in other areas. This is obvious given that in these areas the least favored social groups have come to live. To speak of a policy of job creating, is generally a commonplace that hides the plans for expulsion. To speak of unemployment, is a
political question that is based on problems that are broader than those of urbanism. It is difficult to imagine employing only those persons who live in slums. In the first place because as soon as they can achieve a better economic situation they normally leave and the story begins again. There are intermediate solutions, generally resolved by relocation or indemnization of these groups that who in any case will be expelled by rent increases. It is difficult to organize a local employment policy, at least it would be in the case of Spain with its 15% rate of unemployment and an almost inverse relation employment-housing. The second place the kind of worker who is unemployed in these areas tends to be unskilled versus the kind of service jobs that are being created and of city centers. Moreover if we take account of the fact that 75% of the jobs in the United States in the last five years have been created by firms with less than 20 workers, we see that the situation in Europe must be similar. I think that the policy of neighborhood employment is unreal, and that it is based more on objectives from political economy or from a global planning perspective for the city when as an attempt to resolve unemployment in a given area because it is very evident and ugly.

With respect to commercial development policy it should be noted that the massive creation of new businesses, of large firms, laws, huge supermarkets, would destroy the precarious commercial equilibrium of an area that in many cases may have an important cultural and environmental interest. Neighborhood solutions such as those which Baltimore uses to promote small businesses around markets may be much more useful than, for example, Harborplace, which is perfect for areas of redevelopment. Even while renovation is taking place, I think it is very important that the commercial typology of the area be preserved. I find the HUD template on commercial neighborhood revitalization to be a useful manual for development in various stages while equalizing risks. In any case there is a full and detailed bibliography, but it tends to consider primarily revitalization as a function of consumption. Although this is important, revitalization should be aimed at the population, its necessities, and the use of the environment for the population. It is only too normal to see an artificial renovation that ends when the shops are closed.
3. Design, internal migration. From my point of view the most interesting research on design and environment are those which are studied by W. Michelson that aims at a methodology, in stages, with very complete social diagrams, and that can provide a very interesting occupational scheme. It would be useful to develop Michelson's diagrams with European data since the majority of jobs in Washington, Boston or Toronto, perhaps with the exception of Boston, hardly have anything in common or anything that is useful.

Figure 4-5: 3
The Social Implications of Housing. A paradigm.
The scheme developed by E. Zeitz could be useful in the case of an area whose perspectives for revitalization and change are more radical, rapid, and directed than what is normally the case in Europe; but it is useful in any case.

**Figure 7-2. Private Urban Renewal Model**

A. Solid housing stock
B. City with capacity to employ professional and/or managerial population
C. Absentee ownership with vacant housing and/or tenant population
D. "Tight" housing market
E. "Pioneers"
F. Realtors
G. Speculators
H. Contractors & builders
I. Lending institutions
J. "City conscious" population
K. Local control of zoning
L. Affluent population
Problems of the environment and of internal migration should be considered in terms of the extensive possibilities that they offer rather than as a determining factor. The studies of Ross or Peter Rossi deal with intra-city mobility from the point of view of status, the location of services, taxes. At this point we know that the children's school has a greater influence in where a middle class family locates then does the energy crisis or other variables which are apparently more important. The kind of person who returns to the cities is an educated, consumerist professional (the liberal and intellectual minorities that are tied to the city) and that have economic means at their disposal. These groups share similar characteristics with respect to the economic aspect. Nevertheless, these studies only make subtle analyses of changes and availability in the housing market (filtration theory, etc.) rather than really finding the causes of movement.

The diversity of the investigations that have been done in the United States and in Canada are quite useful for getting to know the urban reality. The weak point is that although the "technology" is very developed, there exists an important conceptual and systemological weakness, a theoretical weakness that allows few possibilities for the conclusions that are arrived at, and an even greater weakness in the face of change.

4. Social repercussions. I am more and more convinced that to speak of social problems and their "cures" that urbanism offers for them is a fallacy. Unemployment and social pathologies correspond to political and economic problems with a balanced regional development their effects can be ameliorated: the promotion of public works in certain areas, funds for housing conservation, or even public housing; these are all small partial solutions. I agree with Richardson when he says that relocation is frequently not very important. When houses are in ruins it is more important to get a new house than it is to wait ten years for the benefits of renovation. This is frequently the case in redevelopment, but it is also the case even in conservation; I have found entire neighborhoods wishing to flee to more desirable areas and where the planner was almost stopping the flight in favor of an architectural solution. Ignoring these exceptional situations, I think that population conservation is fundamental for maintaining the personality of an area. Programs which encourage renters to buy their houses and therefore not be subject to displacement because of rent increases, or policies to protect
renters who have been in their dwellings for a certain time may be perhaps the most useful, among those many possibilities offered by American renovation programs. In the case in which relocation is inevitable, it is important to maintain homogeneity and to try to split up the population as little as possible. Nevertheless, in this area, as in many others, the situation is not well studied and little is known about what happens with these groups after having been expelled, except that they do not tend to gain much from the change.
References

Books


Bourne, Larry S. *Internal Structure of the City.* New York, Oxford University Press, 1971


Denzin, N.K. *The Values of Social Sciences*


Harvey, David. *Urbanismo y Desiguacdad Social.* Madrid, Siglo XXI, 1977


Keyes, L.C. *The Rehabilitation Planning Game*. Massachusetts, MIT, 1969


Le Droit a La Ville, Editions Anthropos, 1968

Lieben, Elliot. *Tally's Corner*


References
Articles and Reports


Alpern, David M. The Older America-Mr. Fixit for the Cities. Newsweek May 4, 1981


Harvey, David. The Political Economy of Urbanization in Advanced Capitalist Societies. Metro Center, Johns Hopkins University, 1979


Kearns, C. Kevin. Inner Urban Squatters in Western Industrialized Society: A London Care Study. Ekistics, April 1979

Klein, Robert J. Transportation Planning: Developing A Scenario Methodology Chapel Hill, 1980

Lenwood, David/Van-Horne Winston. The City Renowned: White Dream-Black Nightmare Black Schoolar - 7 1975


Lewis-Beck M.S./MOHR Lawrence. Evaluating Effects of Independent Variables: Political Methodology 1976

Lewis-Beck, Michael S. The Relative Importance of Socioeconomic and Political Variables for Public Policy. American Political Science Review 1977

Lipton, S. Gregory. Evidence of Central City Revival, American Institute of Planners Journal, 1977


Michelson, William. Urbanism as Ways of Living: the changing views of planning researchers, Ekistics, July 1975


Nanetti, Raffaella Neighborhood Planning in Europe: Vive la Difference, Planning, Nov. 1980

Piccinato, Giorgio. Historic Centres in the Economy of Italian Cities: A European Perspective, 10th Annual Fellows Conference


Turner, Malcolm E. The Regression Analysis of Causal Paths, Biometrics, June 1959

Wright, Sewall. Path Coefficients and Path Regressions: Alternative or Complementary concepts? Biometrics, June 1960

Wynn, Martin. San Cosme, Spain: Planning and Renewal of a State Housing Area, American Planners A. Journal, 1980


Local Capital Improvements and Development Management, 1980
THE IMPACT OF THE CHANGING INFORMATION ENVIRONMENT
ON TRANSPORTATION AND PLANNING

By: Donncha O'Cinneide
Senior Visiting Fellow
Center for Metropolitan Planning and Research
The Johns Hopkins University
Baltimore, Maryland 21218

December 1980.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>THE GENERAL RELATIONSHIP BETWEEN TRANSPORTATION AND TELECOMMUNICATIONS</td>
<td>4</td>
</tr>
<tr>
<td>THE CHANGING INFORMATION ENVIRONMENT</td>
<td>5</td>
</tr>
<tr>
<td>Developments in Computer Technology</td>
<td>5</td>
</tr>
<tr>
<td>Developments in Telecommunications</td>
<td>6</td>
</tr>
<tr>
<td>The Present Status of Telecommunication Services</td>
<td>9</td>
</tr>
<tr>
<td>The Convergence of Information and Telecommunication Technologies</td>
<td>14</td>
</tr>
<tr>
<td>Effects of the Changing Information Environment on Society</td>
<td>14</td>
</tr>
<tr>
<td>Implications for Transportation</td>
<td>20</td>
</tr>
<tr>
<td>A REVIEW OF TRANSPORTATION/TELECOMMUNICATION STUDIES</td>
<td>22</td>
</tr>
<tr>
<td>General Comments</td>
<td>22</td>
</tr>
<tr>
<td>Typology of Studies</td>
<td>24</td>
</tr>
<tr>
<td>A Review of Field Studies</td>
<td>26</td>
</tr>
<tr>
<td>Unresolved Issues: More or Less Travel?</td>
<td>37</td>
</tr>
<tr>
<td>THE IMPACT OF TELECOMMUNICATIONS ON TRANSPORTATION AND PLANNING</td>
<td>39</td>
</tr>
<tr>
<td>Transportation System Impacts</td>
<td>40</td>
</tr>
<tr>
<td>Energy Implications</td>
<td>42</td>
</tr>
<tr>
<td>Decentralization</td>
<td>44</td>
</tr>
<tr>
<td>Social Issues</td>
<td>45</td>
</tr>
<tr>
<td>CONCLUSIONS</td>
<td>46</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>48</td>
</tr>
<tr>
<td>------------</td>
<td>----</td>
</tr>
<tr>
<td>APPENDIX A: Travel-Time Budgets and the Future Use of Telecommunications</td>
<td>53</td>
</tr>
<tr>
<td>APPENDIX B: The Incorporation of Telecommunications into the Transportation Planning Process</td>
<td>57</td>
</tr>
</tbody>
</table>
INTRODUCTION

Urban development plans today are usually based on solving existing social, land use and transportation problems rather than anticipating the urban forms best suited to our future needs. This occurs because planners normally use trend type projections (frequently in the form of complex pseudo-behavioral models) to quantify the future magnitude of their present problems. Radical societal changes are not predicted by these models since such changes are often not significantly present in the data used to build and 'calibrate' these models. In recent years largely unforeseen trends in urban development include declining city populations, increasing blue-collar unemployment, rapid suburban development and the growth of exurban or rural areas.

Many of these radical changes in living patterns resulted from the growth of automobile usage and from low energy costs. However, futurists are now predicting that both urban and rural living, working and interaction patterns will change drastically over the next twenty to fifty years as a result of the impact of energy shortages and increased energy costs.

To resolve both our present transportation problems and to plan our future transportation systems a basic understanding of the particular needs and demands of man as a transport user is required. However, little information is available in this area although a vast amount of general information has been collected on urban travel patterns and volumes (mainly as a result of urban transportation planning studies). Transpor-
tation is one sub-system of a larger urban system consisting of elements such as land-use, business, etc. The linkages or relationships between transportation and these other sub-systems must be understood for orderly planning of the urban and ex-urban environment. To date the planning of these areas has generally consisted of planning each element or sub-system in isolation. However, the perturbation of one component in one sub-system can grossly affect components in other sub-systems. The need for a systems approach for resolving urban problems has been convincingly argued by Kolbuszowski (1) and others.

A further variable relevant to the future of urban areas is the new 'information environment' which is being created by the complementary rapid growth in electronic data processing and telecommunications. The predicted vast increase in communications of all types has obvious implications for transportation and urban planning but little information is available on the existing linkage between transportation and telecommunications.

The effects of the new information environment are expected to be as radical as those introduced by the development of the internal combustion engine. Failure to plan for these changes would be comparable in importance to the failure to anticipate the explosive growth in car ownership earlier in this century. However, existing city plans do not anticipate the expected radical changes in living and working patterns. Experts agree on the magnitude of the coming impact but there is disagreement on the impact of the new technologies on specific sectors of the economy such as transportation.
This work briefly summarizes the implications of the changing information environment for society and then examines the available evidence on the relationship between transportation and telecommunications from a number of countries. The expected impacts of the new electronic technologies on planning and transportation are next considered. These impacts are likely to differ between countries depending on the existing land use and transportation systems. Probable differences between the United States, the United Kingdom and the Republic of Ireland are identified.
THE GENERAL RELATIONSHIP BETWEEN TRANSPORTATION AND TELECOMMUNICATIONS

Both transportation and telecommunications are the result of the same underlying commercial and social connections. The role of transportation encompasses the transfer of people, goods and information while the sole function of telecommunications is the transfer of information. Thus the function which both transportation and telecommunications have in common is the transfer of information. The general relationship between human trips and artificial media with information flow suggested by Kolbuszewski (1) is shown on Figure 1.

FIGURE 1

Relationship Between Human Trip and Artificial Media with Social Flow of Information

SOCIAL FLOW

NON-INFORMATION FLOW
(Energy, Commodity)

INFORMATION FLOW

HUMAN TRIP

ARTIFICIAL MEDIA
(non-trip)

MAIL
MESSENGER

TELECOMMUNICATION
TELEPHONE
TELEGRAM
TELETYPE
TELEVISION (GRAPHIC
DISPLAY)
TELE-PRINT
(FACSIMILE)
THE CHANGING INFORMATION ENVIRONMENT

A radically new information environment is being created by the convergence and interlinkage of information technology and telecommunications. This new information environment has profound implications for society (e.g. automatic control of production and resources, electronic surveillance, etc.) and has been viewed as more disruptive than any previous technological impact. The developments in computer and telecommunications technologies which are creating this changing information environment are outlined in the following pages. Possible changes in the different sectors of society (politics, business, etc.) are then briefly considered with emphasis on communications aspects. Finally the implications for transport of the new information environment are examined in more detail.

Developments in Computer Technology

The rapid development of computer technology especially over the last twenty years has been analysed in detail elsewhere (2). The growth of this technology has been much faster than in any other technological area. Thus the developments of new systems have been in generation terms (embodying radically new jumps in capability) rather than the incremental growth which is the norm in other technological areas. Computers are becoming smaller, faster and cheaper and these trends are expected to continue in future. To these quantitative trends within computer technology may be added comparable qualitative
changes in computer programming i.e. in software. These changes are not only in the development of new programming languages and new programmes but in the ancillary range of operating instructions, in more sophisticated systems analysis in general, and, importantly, in the development of automatic programming.

A further qualitative impact of computers in in their rapid extension through many different areas of human activity from the individual, community or local business levels to national and international levels.

The increase in the growth and interlinkage of large computer networks and their control capacities will cause significant changes as society begins to rely more and more on cybernetic control systems for many routine production, service and maintenance functions.

**Developments in Telecommunications**

Telecommunications technology has changed dramatically during the past twenty years due to rapid developments in electronics and optics. These changes and the probable future developments have been outlined by various authorities (3). However, unlike computer technology, many of the new developments in telecommunications have not been brought into widespread use due to the high costs involved in modifying the existing telecommunications network. Telecommunication media in widespread use today include telephone, telex, telegraph, television and radio, while more advanced media such as videophone (picture phone), facsimile
transmission, viewdata, etc., although technologically feasible are not yet in widespread use. The current status of these services is reviewed later.

The telephone system is expected to form the main telecommunications distribution system in future due to limitations of channel sizes in air based media and is therefore of particular interest here. Digital transmission, in which speech is sent by a series of impulses in the form of a code, is expected to replace the present analogue transmission of speech in future. This pulse technique is suitable for the combined transmission of all types of telecommunication signals including television, videophone, data and facsimile.

The telephone system consists of pairs of thin insulated copper wires joining each telephone to the local exchange. Each exchange is then connected to other exchanges by hierarchical and/or network systems consisting of various combinations of co-axial cables and microwave radio (both direct overland and via communications satellites). The capacity of these main telecommunications 'highways' has been increasing in order of magnitude terms (like computer capacity) over the past twenty years. Recent new developments using helical waveguides and laser transmission along optic fibres (embodying further radical jumps in channel capacity) are now being operated by telecommunication operators in a number of countries. Telephone exchanges are in the process of being changed from electro-mechanical to electronic operation in most countries. Extensive use is also being made of computer technology to improve exchange performance.
The main limitation to the introduction of new telecommunication services is the local telephone network. Although the replacement of analogue signals by a series of binary pulses (pulse code modulation) can increase the capacity of wire pairs significantly, the additional capacity is not sufficiently great to permit the introduction of many of the new telecommunication services. It appears at present that the provision of these services requires a completely new local network using coaxial cables rather than wire pairs. The rapid extension of cable television services (which use coaxial cables) in many countries is seen as a relatively cheap method of upgrading the existing local telecommunications network. Existing TV coaxial cable systems provide 300 times the potentiality of copper pair but at present do not have sufficient bandwidth for new telecommunication services such as the videophone.

The rate at which new developments in telecommunications are brought into widespread use in a particular country will depend on several factors including the general state of the economy, the demand for new facilities and the costs involved.

As a consequence of the developments in telecommunications costs have been reducing annually though at a much lower rate than computer costs. Thus for a given level of performance Murray Laver (4) states that the cost of computer equipment has been falling at about 50% per annum whereas the corresponding rate for telecommunications has been nearer 2%. Since the development of telecommunications networks involves
high labour costs it appears probable that radical reductions in costs are unlikely in the future. On the other hand transportation costs are predicted to increase rapidly in future.

The Present Status of Telecommunication Services

The current status of those advanced telecommunication devices which are likely to have a significant impact on transportation are briefly reviewed in the following pages. More extensive reviews are available elsewhere (5,6).

(i) **Cable television**: The penetration of cable television in U.S. homes is growing rapidly because of the availability of communications satellites. More than 4100 separate cable television systems are in operation at present and over 22 percent of the TV owning households subscribe to cable television. As major corporations enter the field it is expected that the penetration rate will double in the next few years. All cable systems installed since 1972 in the U.S. are required by law to have two-way communications capabilities. Although not yet in widespread use the two-way capability enables a number of services to be provided which can substitute for travel (e.g. catalogue shopping, utility meter reading, etc.).

A number of experimental interactive cable television systems are in existence, e.g. QUBE in Columbus, Ohio and the Tama New Town system in Japan. There have also been a limited number of experimental field trials in areas such as education and remote shopping.
Cable television services are available to a much smaller extent in
countries other than the United States. These services are mainly
provided to improve reception rather than to provide a large number of
additional channels and services as in the U.S.
(ii) Interactive air based television:
Ceefax/Oracle: These United Kingdom systems transmit pages of alphanumeric
information through the air to modified TV sets. Home viewers can select
the information required. Both the BBC and the IBA provide similar
systems covering most of the U.K. A system of the same type (Antiope) is
operational in France. Using a telephone as the return path would permit
remote ordering for goods and services.
Prestel (Viewdata): This is a telephone based service available from the
U.K. Post Office. Customers can select information from data banks for
display on TV type terminals. The service provided is far more extensive
than that provided by the Ceefax/Oracle systems, because by dialing
different telephone numbers, different data banks can be contacted.
Remote use of computers is also possible with this system.

The above U.K. systems have not been in commercial operation for long
and there is no information available about their effects on travel.
Direct satellite to home TV systems: The Communications Satellite Corporation
(COMSAT) has announced plans for a satellite-to-home system which would
initially broadcast three channels of subscription programming to residents
of the U.S. eastern time zone. It is estimated that it would take three
to four years to inaugurate service following approval by the Federal
Communications Commission. This system would be particularly applicable to areas without access to high-capacity cable TV systems. Tests of similar systems are being carried out in Japan and Canada. A teletext service similar to that provided by Ceefax/Oracle systems in the U.K. can be provided by direct satellite systems.

Educational TV: Special university level educational services are being provided via normal TV channels in many countries (e.g. the U.K. Open University). Interactive services are not yet in regular operation.

(iii) Facsimile: This permits copies of documents and sometimes transparencies to be transmitted over telephone lines. A4 size pages can now be transmitted in 30 seconds although most commercially available devices take longer. Several terminal types are available and their use is growing rapidly (at a rate of 20-25 percent per annum in the U.S.). However the terminals produced by different manufacturers are not compatible. Also, the quality of documents transmitted is inferior to Xerox. To obtain Xerox type reproduction requires a broadband carrier system at present. The quality of facsimile transmission is reduced where electro-mechanical exchanges are still in operation.

(iv) Radiopaging: This is a pocket sized alarm or message system functioning within a wide service area. It is available in many countries.

(v) Mobile telephones: These are commercially available in a number of developed countries. The user charge is very high due to overcrowding of the air waves but the development of short wave antennae ("cellular" system) may soon overcome this problem.
(vi) **New telephone services:** A number of enhanced telephone services which could reduce travel are available in the U.S. at present. An example is the patented "transaction telephone" which permits limited financial transactions to be carried out remotely. Touch-tone telephones which are more expensive than dial telephones (partly due to increased maintenance costs) are required for these services.

(vii) **Video-telephone:** This has not been a commercial success in the U.S. and is no longer commercially available. Transmission over wire pair telephone lines has not proved satisfactory for the American Telephone and Telegraph Companies (AT&T) "Picturephone" system.

(viii) **Teleconferencing:** Conference call telephone services are offered in many countries but are not generally considered satisfactory as a substitute for travel. More sophisticated teleconference networks are operational in a number of countries and their use has been extensively studied. These systems require specially equipped rooms for successful use and usually include graphics and facsimile transmissions capability. Teleconferencing can be divided into audio and video systems. Audio systems may or may not have some means of identifying individual speakers and may have electronic blackboards in addition to facsimile transmission. Several private and governmental teleconferencing networks are currently operational in the U.S. Both the U.K. Civil Service and the U.S. General Services Administration) Federal Government) operate networks connecting eleven meetings rooms in eleven different cities. Audio teleconferencing seems particularly suitable for instructional communications in business, government and education.
Video teleconferencing is considerably more expensive than audio and requires far more costly studios, consequently it is not widely used. In the U.S. a service available to the public is provided by AT&T between conference centers in twelve cities (Picturephone Meeting Service) and a broadly similar service (Confravision) is provided by the U.K. Post Office between five U.K. cities with connections also to two cities in Sweden and two in the Netherlands. These systems are monochromatic at present. Noll found that video conferencing is used primarily for committee type coordination and information exchange activities (7).

To date the use of teleconferencing has not been heavy and is still in experimental operation. However it is understood that the AT&T Company are likely to extend their publically available video teleconferencing facilities and to aggressively market both their audio and video systems. The provision of colour transmission appears likely in future video systems.

(ix) Computer conferencing: A number of experimental systems are in operation in the U.S. (e.g. Institute for the Future's Planet system) however these systems are not seen as significant alternative media for travel substitution.

(x) Data transmission: Many countries provide special data transmission services or alternatively private wires can be used. The provision of digital networks are under active consideration in many countries.
The Convergence of Information and Telecommunication Technologies

The developments in computer and in telecommunication technologies previously outlined represent major technical advances. However, a totally new information environment is being created by the convergent interaction of both these technologies. This convergence of computer and telecommunication technologies also permits the rapid growth and diffusion of many extended cybernetic systems (e.g. the automatic control of production, inventory and distribution in industry). The major impacts of the radically new information environment are expected to be felt in developed countries within the next twenty years. The possible range of these impacts on different sectors of society are discussed in the following section.

Effects of the Changing Information Environment on Society

Information and knowledge are the basic resources upon which human survival depends since all other resources depend on them for their development. Possible changes resulting from the new information environment would include a revaluation and reperception of our resource range. However the central significance of these changes lies in the profound consequences for the structure of society itself and for its institutions and values (8, 9, 10). Competition for the allocation of scarce resources is the motivating force of our social institutions. The increased dependence upon information as a major resource could move society to post-industrial forms whose institutions, government and value systems are still open to conjecture. A post-industrial society is seen as being
organised around information as contrasted to an industrial society organised primarily around energy.

Since information/knowledge is seen as the central resource of the post-industrial society towards which we are moving, the new information environment may tend to create new forms of power (based on the access to vital knowledge and information) which will be vastly different to the older forms based on physical control over fixed material assets. Table 1 indicates some of the major characteristics of this new technology.

### TABLE 1

<table>
<thead>
<tr>
<th>Characteristics of the New Information Technology (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exponential increase in the volume of information flow.</td>
</tr>
<tr>
<td>2. Time and distance no longer constraining upon communications.</td>
</tr>
<tr>
<td>4. Decrease in &quot;time cushion&quot; between sociotechnical changes, their impact and consequences.</td>
</tr>
<tr>
<td>5. Increase in dependence upon information and communications services.</td>
</tr>
<tr>
<td>6. Growth of complexly linked systems subtending basic societal services.</td>
</tr>
<tr>
<td>7. Increased interdependence of previously autonomous institutions and services due to feedback required for common information.</td>
</tr>
<tr>
<td>8. Abrupt changes in perception of sociophysical environment.</td>
</tr>
<tr>
<td>9. Radical conceptual changes induced by increased information and communications.</td>
</tr>
</tbody>
</table>
(a) The individual:

Impacts of the information environment on the individual range from suggestions of increased surveillance and monitoring of personal data "in the social interest" to permitting increased personal growth and development as a result of more flexible and equitable access to available knowledge. Social problems may be caused by the division of society into information "haves" and "have-nots". A full discussion of these possible impacts are outside the scope of this work.

(b) Education:

The level and quality of education largely determines the prosperity of a nation or even the survival of human society. In the developing complexity of our present world, lack of education is a form of disenfranchisement. It is also a world which is being transformed by scientific and technological agencies which demand a high degree of specialised knowledge for their continued functioning and development.

Some specific changes in the educational process resulting from changes in the information environment include (8):

1. Widening of the age range of participants in formal education due to the need for retraining and re-education as knowledge increases rapidly in various fields. This is also a result of the redistribution of work and leisure as employment patterns shift in society.

2. Diffusion of the educational process to include 'real life' experience and extramural attainment; the blurring of boundaries between educational and other institutions (e.g., education and work).
3. A major shift in emphasis from learning what is known to learning the means of attaining the necessary knowledge.

(c) **Culture:**

The cultural changes introduced by the new information society may be among the major changes in our future. Already multi-channel television with international broadcasting of entertainment, advertising, etc., has lead to more commonly shared cultural experiences. Paradoxically the main development may be in the increased diversity and fragmentation of cultural patterns resulting from the increase in options and choices open to each individual.

(d) **Business and management:**

Many dilemmas in the management of business and other institutions in our societies results from the radical transformations in the last fifty to a hundred years. As a consequence, the models of many of our institutions and their stated goals and objectives are not in accord with changes which have already occurred in society. For example services in mass transportation are failing or requiring massive injections of public funds for their maintenance. Other operations are changing under pressure from consumer groups as consumers become better informed.

In the post-industrial society of the future it has been suggested (8) that "production industry" will begin to decline as the major motive force and wealth generating sector. Though technically innovative it is no longer socially innovative and no longer plays a prime role in
shaping the values and goals of society. The so-called post industrial society emerges when industrial productivity can be sustained and increased with fewer productive workers. The majority of the labour force moves into the service sector - into managerial and administrative functions, into the knowledge industry of research and development, finance, education, welfare and recreation. Work roles become more diversified and less directly tied to economic productivity. The proportion of the work force in the service sector is used to indicate whether a country has entered the post-industrial phase. Less than 25 percent of the work force in the United States is now engaged in primary production and only about 5 percent in agriculture. This is seen as clear evidence that the U.S. has entered the post-industrial phase. Corresponding values for the Republic of Ireland are 19 percent in industry and 31 percent engaged in agriculture, indicating that Ireland is entering the post-industrial phase. The transition to post-industrial forms will entail a redefinition of roles and values within society. For example the socially useful deployment of human resources may no longer be accommodated within the conventional job market.

Several general trends are discerned by McHale (8):

(i) changes in the hierarchic nature of management,
(ii) a trend towards increased social awareness,
(iii) a trend towards the convergence of public and private organisations.
Many of the essential services in society - education, telecommunications, transportation, information, health services, housing - have developed beyond the economic provision possible by private enterprise. They are increasingly provided by the government or heavily subsidised by public funds. Changes in the concept of profitability may be necessary in order to create the new social services demanded by society in future.

(e) Politics:

In an information dependent society, power tends to be associated with knowledge and information. Due to the swift diffusion of information, the "time-cusion" between the perception of problems and the entry into public dialogue has dramatically decreased. Also as information systems become larger they become less confidential. These two factors suggest that political processes may become more open in future unless the news media is controlled by a particular group or ideology. A further consequence of the new information society could be the emergency of issue oriented politics leading to a less cohesive form of government.

McHale (8) stresses the need for better social indicators to provide early warning systems which would allow the long range planning now considered essential for society. Potentially the new information and telecommunications technologies could greatly assist this need by the extensive use of computer simulation. However such simulation is of limited value until the relationships between the different sub-systems of our society are better understood. The need for real time systems which would provide up to date statistics is also stressed.
Implications for Transportation

Obviously the changing information environment will have profound implications for transportation and transportation planning. There will be an increase in the use of computer simulation for investigating changes in transportation system parameters. Proposed traffic system changes (e.g. in one-way networks) are being simulated before implementation in many cities today. Also the new information systems would permit more direct citizen participation in planning decisions. At the local community level such increased participation could be greatly enhanced by interactive cable television systems.

One specific result of the electronic linkage of individuals, households and communities has been the concept of the "wired city" (there are already many professionals such as doctors "wired" to their workplaces with a pocket signalling device or a mobile telephone). This concept could provide an information capability which could displace many of the temporal and distance constraints which have led to specific growth patterns in urban and suburban communities. Many of these patterns (to work, shop, entertainment, etc.) are already, in theory, obsolete since telecommunications can be substituted for various routine purposes. "More significantly, patterns of transport will change as people and industries (particularly 'knowledge' industries) are freed by the availability of electronic information to determine their home and office location by other requirements than face-to-face interchange of information. If the 'home office' does in fact become widespread, there would be significant modifications to the radial patterns of a large city" (11) (however, a number of recent studies have stressed the importance placed
on face-to-face meetings by business executives). The increased computerisation of routine tasks in production, inventory and distribution control will enable more businesses to locate themselves more flexibly without loss of service quality to customers.

A large scale research effort has been made in Japan (The Plan for the Information Society: A National Goal Towards Year 2000) which recommends that the Japanese government prepare an integrated plan for the development of an information society within the next twenty years. This plan which may be the forerunner of other similar national plans, notes that commercial development of the new information environment may delay its extension to human services such as education and medicine.
A REVIEW OF TRANSPORTATION/TELECOMMUNICATION STUDIES

General Comments

Studies during the last ten years into the relationship between transportation and telecommunications have focussed on the substitution of travel by new forms of telecommunications. Many of these studies have resulted from the escalation of energy costs since 1973. However, the travel saving opportunities of advanced telecommunication had attracted the attention of researchers since the early 1960's. Tyler (12) has reviewed this early literature. More recent studies have been reviewed by a number of authors primarily in order to quantify potential energy savings (13, 14, 15).

Most of the literature on transportation/telecommunications interactions has been largely conjectural and little consensus of opinion has emerged. This, to a large extent, is because of the relatively few controlled field studies which have been undertaken using new media. Until such telecommunications are more widely available it is unlikely that more confident predictions can be made. As a result of the recent partial deregulation of telecommunications in the U.S., the major producers of new telecommunications media and services are not releasing information on studies undertaken. Previously the AT&T Company, the major supplier of U.S. telecommunications published articles on new media use. However, with the convergence of telecommunications and computer technologies neither AT&T nor its competitors (from the computer industry) have reported on the use of new telecommunications media.
The substitution (or diversion) of transportation for telecommunications has been the theme for most studies to date. Extensive psychological and experimental studies carried out by the U.K. Communications Study Group have indicated that both audio and video teleconferencing can substitute effectively for certain types of business meetings (16). It has even been shown that bargaining is more effective by audio teleconference under certain circumstances (17). It is not clear, however, what combination of circumstances will cause people to substitute telecommunications for transportation.

New telecommunications media are likely to generate additional travel (or longer trip lengths) for some trip purposes. However it has been generally concluded by researchers that there will be a net substitution of telecommunications for travel (12). As yet there is little or no hard evidence to substantiate this conclusion. Furthermore as people become more involved with information processing there should be a large increase in communications of all types. Even if substantial diversion of travel occurs, it is suggested that the total volume of travel is unlikely to be reduced to any large extent. However radical changes in travel patterns are likely to occur particularly due to changes in business locations and to an increasing amount of remote work (at home or in neighbourhood work centers).
Typeology of Studies

Tyler (15) has suggested that transportation/telecommunications studies be divided as follows:

(i) **The use of intuitive judgement:** This methodology involves the use of travel statistics. The number of trips for each trip purpose and the magnitude of the resulting travel is ascertained. Intuitive estimates are then made of the proportion of each trip category which appears amenable to diversion by telecommunications.

This type of study is useful for order of magnitude estimates of the potential substitution of existing travel. However, the use of aggregate statistics is questioned since travel behaviour varies widely between individuals.

(ii) **Surveys with hypothetical choices:** A particular category of traveller (e.g. interurban business traveller) is identified and surveyed. Respondents are presented with a range of hypothetical telecommunications options and asked whether they would substitute telecommunications for the specific trip they are undertaking. An example is the well known Bell Canada study (18).

This type of study appears more realistic than type (i) since it involves the subjective response of travellers on specific trips. However since the telecommunications options being presented are not currently available and respondents are not familiar with their use, it is difficult to assess the reliability of the results.

(iii) **Field trials:**

The use of operational or experimental telecommunications systems
is measured. Users are questioned on their preferences, types of communication activity, frequency of use, etc. Studies of this type undertaken to date include the NASA Teleconferencing Pilot Project (19), the AT&T's Picturephone Meeting Service (20) and the U.K. Confravision trials (21).

The results of this type of study provide the most useful information available on the future use of new telecommunications. However the studies undertaken to date have been very limited in extent.

(iv) **Model building using survey data**: This involves using survey statistics to build behavioural demand models which would estimate the proportion of trips diverted and generated by telecommunications. Significant work has been done on investigating the behavioural relationship involved (mainly by the U.K. Communications Study Group) and a model of this type, for travel to business meetings, has been built and calibrated using U.K. data (12). However, the validity of this model has yet to be demonstrated and it is unable to simulate travel generation effects. The difficulty and cost of obtaining reliable calibration data for models of other trip purposes restricts the use of such models at present.

Because of the limited number of advanced telecommunications systems in operation, it is suggested that surveys which would combine intuitive judgement (i) and hypothetical choices (ii) would provide more realistic information on likely future telecommunications/travel behaviour. Thus, given the detailed trip purpose by the survey respondent, researchers could estimate (using the limited evidence from field trials (iii))
whether that trip could be adequately substituted. This would indicate the potential substitutability (upper bound) of that trip type, while it is suggested that the respondents hypothetical choice would tend to indicate the lower bound of substitution.

A Review of Field Studies

For transportation planning purposes trips are commonly divided into the following categories:

a. **Interurban passenger**  
   (i) Business  
   (ii) Other

b. **Urban passenger**  
   (i) Commuting  
   (ii) Shopping  
   (iii) Educational  
   (iv) Social and recreational  
   (v) Personal business  
   (vi) Business (in course of work)

c. **Freight movement**

   To examine the impact of new telecommunications media on transportation the above categories are used because there is some evidence that travel substitution by telecommunications varies with trip length. However it is not always easy to distinguish between urban and interurban trips in large metropolitan areas. The principal results of the major field studies reported in the literature are summarised in the following pages.
Interurban passenger travel

The business sector of the economy is likely to be the first to benefit from new telecommunications media and a number of studies into the potential effects of such media on interurban business travel have been undertaken. No field studies on other interurban trip categories have been found in the literature.

In 1973 the Business Planning Group of Bell Canada (18) questioned automobile, train and plane business travellers on four major intercity corridors in Canada. Survey respondents were asked whether they would have taken their current trip had a number of alternative telecommunications media been available. The principal result was that "approximately 20 percent of the business travellers sampled would not have taken their current trip had an acceptable communications alternative been available" (18). Information on each traveller was also obtained in order to determine whether "substituters" could be differentiated from "non-substituters". However the study concluded that "substituters could not be systematically differentiated from non-substituters by any of the variables measured in the study" (18).

A second major study was that carried out under the auspices of the European Telecommunications Administrations (CEPT). Data on business meetings and travel costs were collected in eight European countries (22). A behavioral demand model developed by the U.K. Post Office and others was used to estimate the proportion of those trips which would be substituted by audio and video teleconferencing (23). Based on U.K. data Tyler (12) reported that, for estimated 1985 costs, 35 percent of trips
to business meetings would be substituted by an audio teleconferencing system and that an additional 1 percent would be substituted by a video system. For the year 2000 it was estimated that 37 percent of the existing trips would be substituted by an audio system and an additional 3 percent by video. The upper bound of travel diversion likely in future was predicted as 41 percent audio and a further 9 percent video.

The results of the U.K. Post Office/CEPT study for travel to business meetings cannot be directly compared with the Bell Canada study (18) since the latter involved all types of business travel. Tyler estimated that a 36 percent reduction in travel to business meetings in the U.K. was equivalent to a 10 to 15 percent reduction in all business travel (12). Assuming the same proportion of meeting/non-meeting business travel for the upper bound travel diversion predicted by the CEPT study would indicate that 17-20 percent of all business travel would be substituted. This proportion is similar to that estimated in the Bell Canada study.

A number of earlier major studies into the substitutability of interurban business travel were carried out by the U.K. Communications Study Group (16). Since the CEPT model was partly developed by this group it is assumed to supersede that work. However it is interesting to note that the "1975 best estimate" for substitutability of existing business meetings was 43 percent by audio media and a further 7 percent by video (16).
Urban passenger travel

The substitution of urban passenger travel involves greater changes in established work and living practices than the substitution of inter-urban travel.

(i) Commuting: Developments in telecommunications could influence the location of office employment and also journeys to work by permitting employees to work all or part of the time at home or at neighborhood work centers (24). Since commuting accounts for a high proportion of all auto vehicle kilometres worldwide (about 34 percent in the U.S. (25)), a number of studies have investigated the direct diversion of existing work trips to telecommunications. However most of these studies have been carried out at the aggregate level and have been estimates of substitutability rather than estimates of the likely level of substitution. All studies reviewed are the "intuitive judgement" type.

In a case study of the San Francisco Bay Area, Jones (26) divided jobs into substitutable and non-substitutable categories. Then travel data was used to determine the proportion of jobs which could be performed at home or at remote work locations. To obtain better estimates of likely substitution, many routine clerical jobs were not considered substitutable as they did not justify the extra telecommunications costs incurred by working at home. The major conclusion was that 22 percent of commuter travel in the Bay Area during the morning rush hour could be substituted by telecommunications. For trips terminating in the city of San Francisco the equivalent value was 31 percent and for trips terminating in San Francisco's central business district, 47 percent substitutable (26).
Tyler quotes similar work by Teruaki Ohara in Japan which "implies a broadly similar result" for overall substitution of home-work travel (12). The proportion of U.K. jobs which might be home based was estimated by Glover (27) to vary from 20 percent (1971) to 26 percent (1991). Using Glover's employment criteria, Tyler estimated that 35 to 40 percent of journeys to work in Central London were "of kinds that might ultimately be substituted by telecommunication," assuming no change in employment patterns (12). These U.K. results are also very similar to those obtained for San Francisco (26) which implies that the potential for remote working is similar in developed countries.

(ii) Shopping trips: In theory new telecommunications could substitute for all shopping trips provided that home delivery systems are available. Two-way information and finance transfers between home and shop terminals would eliminate the need for the shopper to attend in person. Mitchel suggested that 50 percent of all shopping trips were potentially substitutable (28) but this estimate does not appear to have been based on a specific field trial. However home delivery has almost disappeared from most countries except for larger household items. Also research has shown that shopping is enjoyed as a special occasion by many people (in particular non-workers) and individuals have expressed strong preference for the personal selection of goods (29). However a significant proportion of survey respondents indicated that they would like to eliminate routine purchases such as grocery shopping (29). A review of home shopping possibilities has been completed by Edwards (30). No substantive field studies appear to have been undertaken on the effects of new telecommunications media on shopping trips.
(iii) **Educational trips:** The impact of new telecommunications media on education has been widely studied (31, 32, 33) but little information is available on the implications for educational related travel. Theoretically all educational trips apart from those involving specialised equipment could be diverted to telecommunications. An earlier intuitive judgement type study estimated that 25 percent of "education-civic" trips were potentially substitutable (28). However school trip patterns will probably remain unchanged because of the need for specialised supervision and social interaction. As a consequence of the new information environment, a far greater proportion of the future adult population will be involved in education. The opportunities offered by advanced telecommunications are likely to be used to supplement the existing educational system by permitting more extensive and new part time adult educational services.

Grey (34) quotes attitudinal surveys on the use of a remote instructional television system as evidence of the effectiveness of telecommunications to substitute for travel. However if such remote facilities were not available it is not clear that the students involved would have undertaken their courses. Tyler suggests that new telecommunications will probably increase travel but to a limited extent (12).

(iv) **Social and recreational trips:** Videophone services could, in theory, substitute for many visits to friends and relatives. However, as for the telephone (35), the videophone could instead result in increased travel since regular personal contact could be maintained with a larger circle of friends. Similarly better information on leisure opportunities provided by new media seem likely to lead towards increased travel. No field
studies into the implications of new telecommunications for recreational travel appear in the literature although there have been many speculative studies into the social impact of telecommunications. Mitchel estimated that only 5 percent of existing socio-recreational trips were potentially substitutable (28). New cable television/satellite services could substitute for some recreational trips in an era of increasing travel costs and energy shortages since research has shown that recreational trips are likely to be restricted before other trip types (36).

(v) **Personal business trips:** Personal or family business trips include visits to health care centres, banks, insurance companies, etc. It has been suggested that such trips offer great potential for substitution (24). Some limited field studies carried out in Ireland have indicated that people would like to eliminate many of these trips (36). The promotion of electronic fund transfer by banks in many countries should divert some personal business travel. A number of studies have investigated the use of advanced telecommunications in promoting health care (37, 38) but little information is available on transportation implications. On average it seems that there would be a small net increase in travel because of the extended health services possible.

(vi) **Urban business travel:** Business travel comprises only a small proportion of urban travel (5-10%) but it is usually concentrated in congested downtown areas. As previously noted new telecommunications media are being introduced first to the business sector of the economy, and many studies have investigated the possible implications for business travel. Most of these studies do not distinguish between urban and
interurban travel in published reports. However a study in Ireland (39) has indicated that trip length is an important determinant of potential travel substitutability. About 30% of all business trips in Cork, Ireland were considered to be substitutable by audio telecommunications compared with only a negligible proportion of interurban trips. Surveys by the U.K. Communications Study Group (22) have also indicated that the potential travel substitution is noticeably lower for meetings which are over typical inter-city distances. However most of the published work of this group does not appear to include distance as an important substitution parameter and the Communication Study Group's type allocation estimates of trip substitutability seem to refer to both urban and interurban travel (16). However the LRS/CEPT model (described previously in the section of this report on interurban travel) includes the effect of distance as a travel cost.

Studies on urban business travel in the U.S. exhibit a wide variation in substitutability estimates. A Pittsburgh study suggested that approximately 73% of all business contacts could be substituted by telecommunications provided effective systems "are made available at prices participants are willing to pay" (40). Another study gathered evidence to suggest that telecommunications could substitute for 20 to 60 percent of local business travel (41).

Overall substitution of urban travel: A number of general studies have attempted to estimated the potential substitution of urban travel by telecommunications (14, 42, 43). Typically these studies divided urban
travel by trip purpose and then "estimated" the proportion of "substitutable" trips. The usefulness of these studies is limited by the arbitrariness of the values chosen. Values of urban travel substitutability obtained varied from 11 to 22 percent of trips and from 14 to 22 percent of urban vehicle-kilometres. The most recent study appears to be that of Lathy who estimated a 16 percent substitutability of urban vehicle kilometres (14). However it is obvious from this review that little hard evidence is available on the substitution potential of most trip purpose categories and additional field studies are required before much credence can be placed on overall estimates of urban travel substitution.

**Freight movement**

The potential use of advanced telecommunications media to improve the efficiency of freight systems has been extensively studied (44, 45) and is not considered in this report. Otherwise few quantitative estimates of the impact of advanced telecommunications on freight movement have been reported either for urban or interurban areas. Surveys have shown that the intensity of business contacts fall off rapidly with distance (22, 39). Tyler has suggested that advanced telecommunications could reduce the "friction of distance" for business communications thus widening market areas with consequent increases in absolute freight quantities (12). One of the most significant effects may be the transmission of newspapers, mail, computer data, etc., directly to remote terminals. U.S. studies into potential mail substitution have resulted in a wide range of overall diversion estimates (13-60%) indicating that
the relationship involved is not precisely understood. One recent U.S. survey concluded that "some 30 percent or more of first class mail can be handled by some form of electronic fund transfer technique" (46).

Summary of field study results

Table 2 summarises the available trip substitution estimates which are based on field evidence. It is clear that for most trip purposes no firm evidence is available and even for those trip purposes which have been studied the evidence is limited. Comparisons of studies carried out in different countries show surprisingly little variation in the results obtained.
<table>
<thead>
<tr>
<th>Trip purpose</th>
<th>Substitutability estimate</th>
<th>Substitution estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interurban business travel</td>
<td>17-20% U.K.</td>
<td>10-15% U.K.</td>
</tr>
<tr>
<td></td>
<td>20% Canada (18)</td>
<td>(12)</td>
</tr>
<tr>
<td>Interurban leisure travel</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Urban commuting</td>
<td>22% U.S. (26)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>20-26% U.K. (27)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>CBD only:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>47% U.S. (26)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>35-40% U.K. (12)</td>
<td></td>
</tr>
<tr>
<td>Shopping</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Educational</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Socio/recreational</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Personal business</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Business</td>
<td>73% U.S. (40)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>20-60% U.S. (41)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>30% Ireland (39)</td>
<td>-</td>
</tr>
<tr>
<td>Freight movement</td>
<td>13-60% total U.S. mail volume</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30% U.S. First Class Mail (46)</td>
<td></td>
</tr>
</tbody>
</table>
Unresolved Issues: More or Less Travel?

Developments in telecommunications can affect both transportation supply and demand in a variety of ways. The use of telecommunications to improve the supply of transportation (more efficient management of assets, increased route capacity, etc.) has been extensively studied and is relatively well understood (44, 45, 47). Consequently it is not considered in this report. However the likely effects of telecommunications on transportation demand are not at all clear. In the absence of hard evidence expert opinion varies widely; from those who expect substantial reductions in travel demand (48) to those who expect that new telecommunications will result in additional travel (49). Better telecommunications facilities contacts with a greater number of people and also at greater distances. This would lead to an increase in travel unless a substantial amount of travel substitution also occurs or alternatively could alter existing travel patterns substantially.

Tyler distinguishes three kinds of effects - the diversion of communication flows (often termed substitution), the generation of stimulation of demand and the modification of demand for transportation. The studies reviewed in this report almost all concern the diversion of existing travel. No firm conclusions on the probable future amount of diversion can be reached until extensive tests between competing communications media are carried out. Very little substantive evidence is available on generated travel although Tyler quotes some anecdotal accounts from field trials in health care suggesting large effects (12). Lathey states that two U.S. teleconference systems (NASA and DOW) resulted in reduced
amounts of business travel per employee (14). However a more recent report on one of these systems concluded that the employees involved did not reduce their overall travel budget expenditure; instead the money saved on teleconference diverted meetings had been redirected towards other travel (50). This tends to support time budget concepts, viz. that a constant amount of time per day is allocated to travel by each individual (the use of travel time budgets is examined in Appendix A). Tyler argues that "a business communicator is unlikely to spend all the time he gains by substituting telecommunications for travel, in additional communication - let alone spend all of it in the mode of communication whose relative attractiveness has been reduced by telecommunications" (12). Consequently he suggests that in general travel generation effects will be small and this view is supported by Harkness (51) although the latter points out that this may not be true for all classes of trips. However no real evidence is available to either confirm or deny these generation predictions and it is equally valid to argue that the expected increase in communications of all types resulting from the new information environment will result in substantial travel increases.

Finally, it is generally agreed that new telecommunications devices will permit modifications of travel patterns and applications which are not evident at present and these may ultimately have for greater impact on transportation than diversion or generation effects.
THE IMPACT OF TELECOMMUNICATIONS ON TRANSPORTATION AND PLANNING

The consequences of changes in the relationship between transportation and telecommunications have been comprehensively assessed in a major study carried out at Stanford Research Institute (SRI) by Harkness et al. (51). The stated objective of this study was "to comprehensively identify and assess the physical, economic, social, environmental and quality-of-life consequences that may result from a shift in the interactions between telecommunications and transportation." No comparable analysis has been carried out elsewhere although a number of less extensive investigations have been undertaken (53).

To assess the impact of new telecommunications media on society the Stanford Research Institute (SRI) study postulated a range of plausible future scenarios induced by predicted transportation/telecommunications interactions (51). The consequences of these scenarios were then investigated. Three interurban scenarios were developed, one assuming 20 percent substitution of all interurban business trips by teleconferencing and the second arbitrarily assuming an equal increase in business travel. These two scenarios were compared with a third based on the projected industry forecasts of air travel growth to the year 2000. The SRI study concentrated on comparisons between the first and third scenarios - little substantive work was done on the second since its occurrence was considered unlikely by those involved in the study. Four urban scenarios were developed, two dealing with office relocation from central business districts to the suburbs - (i) decentralization to a few satellite centers and (ii) random decentralization.
It was also assumed that audio and video teleconferencing would replace about 20 percent of local business trips that today would require travel. The other two urban scenarios were more radical in concept. One assumed that a substantial proportion of office workers would work at home 95 percent of the time and the other assumed they would work in neighbourhood work centers. The development of the above scenarios was based on a large number of detailed background reports.

From the review of the transportation/telecommunications studies earlier in this work, it appears that the substitution values and scenarios chosen for the SRI study are realistic. Also it appears that the use of new telecommunications in different countries is quite similar. Consequently the SRI conclusions may be broadly applicable elsewhere.

The principal conclusions of the SRI study and other evidence on the impacts of telecommunications on transportation and planning are next considered. The likely implications for the U.K. and the Republic of Ireland are then briefly discussed.

**Transportation System Impacts**

The SRI study concluded that 20 percent substitution of interurban business travel by telecommunications would seriously affect the viability of existing U.S. intercity airline travel. The need for V/STOL and SST aircraft would also be reduced since they cater primarily for business people and others whose time is considered valuable or who must meet quickly in crisis situations. The necessity for airport expansions would be reduced in some cases. Domestic air services in the U.K. and Ireland
should also be affected by new telecommunications but, due to the shorter distances involved, the airlines are not as heavily dependent on domestic business travel. The viability of European services from both countries should be seriously affected if a similar proportion of international travel is substituted. However limited evidence suggests that international travel is less likely to be substituted by telecommunications (39).

The viability of interurban train services in the U.K. and Ireland would probably be seriously affected by telecommunications substitution - especially the high speed services being developed in the U.K. However where wideband (video) telecommunications are used as a substitute for rail travel, the projected cost savings per traveller may not always be favourable to telecommunications (53).

Large scale replacement of commuting trips to central business districts would result from each of the four urban scenarios developed in the SRI study. This is predicted to have a devastating impact on the financial viability of existing U.S. rapid transit systems (typically 40-80% U.S. rapid transit trips are CBD oriented (51)). It is also suggested that considerable savings could be made in projected urban transportation investments (both rail and freeway) by the elimination of CBD growth.

These conclusions appear generally applicable to the U.K. and Ireland. Rapid transit systems in the U.K. are probably not as dependent as U.S. systems on commuter trips to the CBD but existing decentralization trends are rapidly changing this situation. Suburban rail services in Ireland
are almost entirely dependent on CBD commuter trips and would be seriously affected. Urban bus services in older U.S. cities as well as in Ireland and the U.K. would lose a considerable amount of revenue. In European cities where traffic restraint is practised as an alternative to the construction of urban freeways, telecommunications may be chosen as preferable to mass transit.

Work decentralization induced by telecommunications would also reduce existing urban traffic congestion and its attendant environmental problems. Traffic accident rates should also be reduced.

The economic justification of public investment in transportation facilities depends heavily on the value attributed to savings in journey time. The highest values of time are ascribed to business trips and to a lesser extent journeys to work by high income groups. Tyler has pointed out that the replacement of some of these trips by telecommunications could have a much greater impact on the economic viability of new transportation investment than the overall figures for trip substitution would suggest (12).

**Energy Implications**

The predominant interurban and urban modes of transportation are very heavy users of energy and the use of telecommunications to substitute for travel normally involves substantial energy savings. Substitution for urban commuting has been estimated by Nilles to reduce energy consumption by a factor of 25.6 when the private auto is used and between 2.4 and 12.1 for public transport depending on the load factor (54).
These figures broadly agree with U.K. estimates (53). A French study showed that a doubling of all energy costs would increase telecommunications costs by only 1.9 percent compared with an increase of 12.7 percent for transportation (47).

Significant energy savings have also been found for intercity business travel substitution (41, 53, 55) although the quantity saved is dependent on the type of telecommunications system, the alternative mode of travel and the contact time involved. However most studies have indicated that the substitution of urban commuter travel by telecommunications offers much larger potential savings than intercity travel substitution.

No studies have yet been completed on the energy costs involved in setting up new telecommunications systems. However it is generally agreed that the available evidence strongly favours the telecommunications alternative to travel.

A number of U.S. studies have attempted to quantify the energy saved by substituting telecommunications for travel (13, 14, 15, 6). Estimates ranged from 1 to 7 percent of total U.S. petroleum demand for urban areas depending on the substitution level assumed. For interurban travel, Harkness has estimated that a reduction of total business air travel by 20 percent would save 0.3 percent U.S. petroleum demand (56). Substituting 20 percent of all business travel by auto would save a further 0.5 percent. The energy saving potential of new telecommunications has been shown by Harkness to be of the same order of magnitude as other energy conservation concepts (e.g. van pool programmes, improved building thermal standards, etc. (56)).
However the predicted energy savings by substituting telecommunications for travel may not be fully achieved since different travel trips may replace the substituted trip. It is also not clear from the available research evidence whether decentralization of homes and jobs leads to more or less travel. Harkness suggests that it may be necessary to change travel budgets and travel authorization procedures if a reduction in total business travel is desired. Similar policy measures may be required for private travel to encourage net travel substitution. However substantial energy savings should be achievable in all countries where telecommunications can substitute for travel.

**Decentralization**

It has been generally assumed that new telecommunications will assist decentralization of both homes and jobs. However telecommunications also permits the concentration of certain jobs, e.g. the headquarters of companies can congregate in downtown areas remote from their production facilities. Other factors such as energy costs, land cost and availability, planning controls, etc., are probably of greater importance than telecommunications in determining future urban form. U.K. research by Goddard suggests that telecommunications development may accelerate job dispersal within metropolitan regions but does not appear as significant for longer distance moves (57). The SRI study postulated that improvements in telecommunications would reduce the needs for office organisations to cluster in central business districts and would result in their relocation to the suburbs (which is consistent with the U.K. evidence). However the
decentralization of office jobs is likely to be significantly less in the U.K. and Ireland than in the U.S. because of more restrictive planning controls in these countries.

Social Issues

The reduction in local tax revenue as a result of decentralization is of particular importance to U.S. inner city administrations. This is also relevant to the U.K. and Ireland but to a less significant extent. The decentralization of CBD office jobs would also increase social problems in inner city areas. There are a number of other social issues raised by the widespread use of new telecommunications (24, 27). These include the problem of equity raised by differing degrees of access to new telecommunications technologies for different social groups. Substantial reductions in transportation employment would also result from widespread travel substitution. These are disturbing long term problems which must be considered as part of the overall impact of new telecommunications on society.
CONCLUSIONS

Many of the issues raised in this report are necessarily tentative because the full impacts of developments in telecommunications are still unclear. The key question of the media split between different communications modes remains unresolved. Detailed econometric studies of data on past flows of telephone calls and letters undertaken by the U.K. post office failed to find any evidence that changes in the availability or price of one service affected the other (12). Similarly a detailed re-examination of the field data collected for an Irish study (39) by the author has clearly indicated that telephone calls and face-to-face meetings are, on aggregate, used for quite different purposes and very little diversion of existing travel to telephone appeared possible. This result substantiates the result of an earlier U.K. study, that only 3 percent of recorded meetings were considered substitutable by telecommunications (58). Extensive modal split modelling studies have also indicated that specific travel trips are largely captive to certain modes and that the price elasticity is small. This raises the question of whether new telecommunications devices will substitute for a range of travel purposes or alternatively only for specific trip types. It appears from teleconferencing field tests that only certain types of business meetings are suitable for teleconferencing viz. regularly scheduled information meetings (7).
However the potential impacts of new telecommunications on society in general and on transportation and planning in particular are of such magnitude that continuing research in this area is required if radical future problems are to be avoided.
REFERENCES


48. 

49. 


APPENDIX A

Travel-Time Budgets and the Future Use of Telecommunications

Empirical research has shown that individual travellers and households spend a fairly constant amount of time (or time and money) on travel (1A, 2A). This daily constraint on travel, known as a travel time budget, has been shown to be reasonably constant at aggregate level, regardless of city size, and stable over time. Travel time budgets per traveller have been found to vary from 1.0 to 1.5 hours per day (3A). Zahavi has suggested that expenditures on travel by households is a relatively stable proportion of total household expenditure at all income levels; 15-17% for car owning households and less than half this value for non-car owning households (4A). However invariant expenditure of either time or money on travel is inconsistent with rational economic behaviour and with conventional transportation modelling. A theoretical analysis by Tanner concluded that generalised expenditure on travel might be invariant (5A). Data from the U.K. National Travel Survey was used to indicate that generalised expenditure is much the same in urban as in rural areas, despite the wide variation in modes available and distances to destinations (5A).

Goodwin using London Transport study data (1971-72) empirically tested the stability of individual travel time budgets by examining variations for different traveller characteristics such as income and
car ownership (2A). He concluded that the evidence was inconclusive but his work also supports the concept of some upper bound on travel time. Goodwin also suggested that the total time allotted to travel is likely to increase as the barriers to travel are removed but subject to a saturation level. However it appears unlikely that the existing barriers to travel will be eased due to the predicted energy cost increases.

A study was recently completed in Baltimore into the stability of travel time and money budgets at disaggregate level using a random 966 household day-long trip diary (6A). At aggregate level the proportion of gross household income spent on travel (15.45%) correlated very well with Zahavi's results. However the proportion spent varied significantly with income (from 22% for the lowest income group to 11% for the highest). Thus Zahavi's hypothesis of a constant allocation of income (15%) on travel (irrespective of household income) was rejected at the disaggregate level. Analysis of the Baltimore data at aggregate level gave an average daily travel time per traveller of 1.28 hours and this value showed insignificant variation across various sizes of households (in terms of number of travellers). This result conforms with Zahavi's findings of a relatively constant travel time per traveller (4A). The Baltimore data showed some variance within the population of each stratified group (race; income; location; vehicle availability) but generally the absolute size of the variance was small (5 to 7 minutes) and could have resulted from data inaccuracies. The
difference between the average daily travel time for travellers from zero and two car households was only 5.4 minutes while the same difference was found between outer city and downtown residents (those living outside the city of Baltimore recorded travel times midway between these locations).

Thus it appears that the concept of a constant daily travel time per traveller has some merit especially when applied in aggregate for urban areas. However the range in values between different cities (1 to 1.5 hours) recorded by Zahavi (4A) suggests that caution is required in transferring this concept between cities.

The concept of a daily travel time constraint appears subjectively valid and the evidence to date suggests that, on aggregate, it remains stable over time. This uniformity of travel budgets suggests that, if advanced telecommunications reduced commuting, non-work travel would increase correspondingly to maintain the same travel budget. The results of many transportating studies indicate that the length and number of journeys undertaken by each traveller are increasing over time. Unless the future rate of transportation system improvements continues at past rates (which appears unlikely because of predicted energy costs and financial constraints) it is suggested that daily time budget constraints will reinforce the use of advanced telecommunications media as a substitute for travel.
Appendix A References


5A) Tanner, J. C. "Expenditure of Time and Money on Travel," Transport and Road Research Laboratory, Supplementary Report, SR 466, Crowthorne, Berkshire, 1979.

6A) Makofski, R. et al., Draft report on the stability of travel budgets at disaggregate level, Metro Center, Johns Hopkins University, Baltimore, Maryland, 1980.
APPENDIX B

The Incorporation of Telecommunications into the Transportation Planning Process

New telecommunications media will have a major influence on future transportation and land use requirements. Thus it appears logical that telecommunications should form part of the comprehensive land use/transportation planning process. The inclusion of telecommunications could result in deferring or foregoing some transportation system improvements (which might result in a net savings of energy). However it is not clear how best to incorporate telecommunications in the planning process. It could be included in the modal split stage as an alternative "transportation" mode using realistically calibrated models for each trip purpose. However this would ignore the effects of new telecommunications on trip generation and urban form.

As previously indicated, transportation and telecommunications are probably not alternatives for more than a small proportion of total communications; each appears primarily to serve a different communication need. Consequently it is suggested that telecommunications should be considered as part of the trip generation stage of the planning process. Thus models could be developed to generate telecommunications and transportation "trip" rates separately. The communication rates generated could then be examined for time budget restraints and the likely number of captive communications by transport and telecommunications identified. Separate distribution, modal split and assignment models should be developed to give total assigned flows to the transportation and
telecommunications networks. Since the new telecommunications models will be partly speculative initially, sensitivity analysis must be incorporated in the process. It is suggested that new telecommunications media trip rates should be varied by ±5% for business and commuter trips and by ±10% for other trip types.
"COMMUTER RIDESHARING, AN OVERVIEW"
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I) INTRODUCTION.</td>
<td>1</td>
</tr>
<tr>
<td>II) ADVANTAGES OF COMMUTER RIDESHARING</td>
<td>13</td>
</tr>
<tr>
<td>1) The national level</td>
<td>13</td>
</tr>
<tr>
<td>2) The employees</td>
<td>18</td>
</tr>
<tr>
<td>3) The employers</td>
<td>29</td>
</tr>
<tr>
<td>II) INSTITUTIONAL CONSIDERATION.</td>
<td>33</td>
</tr>
<tr>
<td>1) Foreword</td>
<td>33</td>
</tr>
<tr>
<td>2) legislative history of ridesharing activities</td>
<td>33</td>
</tr>
<tr>
<td>3) Legal impediments to ridesharing activities</td>
<td>37</td>
</tr>
<tr>
<td>4) Operating modes for ridesharing systems: the brokerage approach</td>
<td>43</td>
</tr>
<tr>
<td>III) RIDESHARING AND ITS APPLICATION TO FRANCE</td>
<td>48</td>
</tr>
<tr>
<td>IV) CONCLUSION.</td>
<td>52</td>
</tr>
</tbody>
</table>
- LIST OF ACRONYMS -

- UMTA : Urban Mass Transportation Administration
- HUD : department of Housing and Urban Development
- VMT : Vehicle Miles of Travel
- AOA : Administration On Aging
- DOT : Department Of Transportation
- TSM : Transportation System Management
- HOV : High Occupancy Vehicle
- FHWA : Federal Highway Administration
- CBD : Central Business District
- DOE : Department Of Energy
- EPA : Environmental Protection Agency
- MPO : Metropolitan Planning Organization
- FLSA : Fair Labor Standard Act
I) INTRODUCTION

Most american cities have witnessed an outward movement of the population from their core areas to the outer edges of the urban system. This is principally due to the development of the automobile as the best way to keep mobility along travel corridors of much lower density (cumulative effects) and to the search for superior low densities residential amenities (environmental, fiscal advantages). See the case of Milwaukee in FIG-I-1 as representative of development trends.

As developmental density was too low to financially support large size transit vehicles, operating on a fixed route and on fixed schedules, in view of the inherent ineffectiveness of conventional transit to serve dispersed travel patterns (and this more and more with the decreasing revenues from the "fare box" together with the increasing operating costs), the automobile appeared to be the long term means of mobility people. (see FIG-I-2 about the increasing reliance on auto ownership and utilization since 1910). There is no such thing as perfect bliss and the american love affair with the automobile began to show negative impacts that become more and more recognized: increasing traffic congestion and air pollution levels, fiscal, environmental and social constraints to major highway construction projects, scarce and costly parking in major activity centers, long, costly and stressful commuting trips, the non-availability of the automobile for everyone (the transportation disadvantaged, including the elderly, the young, the handicapped and the poor) and above all, the dangerous dependence on uncertain and expensive foreign fuel resources.

As a result, attention has focused more and more on other ways of transportation and the traditional approach to such problems has been abandoned. Paratransit systems are among alternatives which have proven their ability to induce net savings in vehicle miles through increased highway capacity and to ensure mobility for those who are disadvantaged from a transportation standpoint. This term denotes group travel by any mode including carpooling, vanpooling, buspooling, share rides, taxi, jitney, either in mixed flow traffic or on exclusive high occupancy vehicle facilities, with the vehicles in use being either privately or publicly owned.

According to what has been said previously, we can define paratransit mode as being situated between two extremes prevailing in common means of transportation:
FIGURE I-1

Persons per square mile

- TYPICAL RESIDENTIAL DENSITIES (MILWAUKEE AREA)
Automobiles per capita

- NATIONAL AUTOMOBILE OWNERSHIP -
Bus -------------- Paratransit -------------- Automobile
Rail

Fixed route ------------------------------------------ Completely flexible
Fixed schedule ( defined time and space )

At this point, two forms of paratransit seem to emerge: the first is oriented towards efficiency and constitutes the topic of this study while the second is socially oriented and focuses upon the transportation needs of people who can be served by neither the automobile or mass transit.

The later form, although not developed in the next sections, must not be neglected because the transportation disadvantaged represent a large amount of the population of the United States, and few words must be expressed to give a better idea of the present and prospective situation.

A transportation disadvantaged is a person unable to drive an automobile or who is not sufficiently wealthy to purchase and maintain one. This includes:

- The elderly; figures are difficult to establish because of the definition itself of old age. The number of people over age 65 is expected to increase from today's 19 million to 27 million in 1990.
- The handicapped (physically or mentally); here the figures can only be approximate in view of the varying degrees of disability. The number of people unable to use mass transit stands currently at 9 million and is expected to reach 11 million by 1990.
- The poor who are in growing number with transportation consuming an increasing portion of the household budget.
- The young, unauthorized to drive an automobile before a certain age that varies from state to state.

As can be seen, the number of those who are transportation disadvantaged is already of some importance (47-70 million), and is expected to increase with the progress in health care. As previously mentioned, accurate figures cannot be given because of the overlapping of certain categories (ex: old people and handicapped).

Paratransit, by providing door to door service and a better level of transportation than conventional transit, has the ability to serve a major portion of this market. The Department of Housing and Urban Development (HUD) launched the first use in federal money for this purpose in the mid 1960's when realizing that inadequate transportation to work is a factor leading to high unemployment rates, and supported projects providing door to door service for people working in suburban areas.
Legislation to enhance their mobility has been enacted by the Urban Mass Transportation Administration (UMTA) of the Department of Transportation (DOT) in 1976 and 1979, requiring that 5% of all formula funds to be eligible for capital or operating assistance of mass transit must be used to serve the mobility of the elderly and handicapped by any adequate system. On the other hand, direct transportation subsidies from diverse social welfare, health, employment and education programs (ex: Administration on Aging of the UMTA) have provided more impetus for the emergence of paratransit as a means of assuming social services, either by initiating their own transit systems or by giving capital assistance to private non-profit agencies. But because of non-coordinated planning and management legislation constraints, administrative requirements (red-tape), eligibility restrictions to many separate sources of federal funds, large scale operations were not able to materialize efficiently. Also, mass transit has always been suspicious of possible competition and even more so as its financial problems have worsened. In actual practice, paratransit acts as a complement of mass transportation (system integration) rather than taking riders from high occupancy vehicles and this is very true for special market's segments as transportation for the disadvantaged where few or no mass transportation options exists. For this complementarity to be achieved, a close collaboration between the providers of transportation must be accomplished to avoid either a repetition or a lack of response to travel needs. In this direction, the role of a broker or coordinator appeared essential to meet potential riders and either public or private providers and will be developed in section III of this study.

Efficiency oriented ridesharing systems are of particular interest in view of increasing automobile operating costs and advantages that are derived from such systems on behalf of the public and of individuals. This interest for energy savings through reducing vehicle-miles of travel (VMT) was particularly acute during the oil embargo of 1973-1974, being in fact the original stimulus of paratransit demonstration programs. Although 2/3 of the programs initiated during this period and accounting for 70% of the total demonstration budget were discontinued, the idea of ridesharing and its advantages was developed and defined. The number of long-range and well-organized vanpool programs have doubled every year since 1974 as shown in the following table:
<table>
<thead>
<tr>
<th>Year</th>
<th>Number of sponsors</th>
<th>Number of sites</th>
<th>Number of vanpools</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td>1</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>1974</td>
<td>15</td>
<td></td>
<td>125</td>
</tr>
<tr>
<td>1975</td>
<td>25</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>1976</td>
<td>56</td>
<td></td>
<td>643</td>
</tr>
<tr>
<td>1977</td>
<td>86</td>
<td></td>
<td>1,100</td>
</tr>
<tr>
<td>1978</td>
<td>122</td>
<td>163</td>
<td>1,986</td>
</tr>
<tr>
<td>1979</td>
<td>308</td>
<td>372</td>
<td>4,382</td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td></td>
<td>7,050</td>
</tr>
<tr>
<td>1981</td>
<td>400</td>
<td></td>
<td>20,000</td>
</tr>
</tbody>
</table>

To these figures, must be added the non negligible number of privately owned and operated vanpools and carpools. This number is very difficult to determine and must be approximatively equal or greater than the number of employer and third-party sponsored vanpool programs.

To understand the increase in car occupancy rates, some data related to the automobile must be given to isolate the problem and to define realistic solutions.

- Transportation accounted in 1977 for 26% of all U.S. energy consumption and 54% of petroleum consumption. On this, the private automobile represented 52% of transportation energy use (and 67% of highway use). In 1980, consumption of motor gasoline reached 7.37 Million Barrels/day (approximatively 310 Million gallons). Despite a drop of 9.7% in oil consumption during the first five months of 1980, the United States continues to be more and more dependent on foreign resources (42%) as shown by the following figures:
<table>
<thead>
<tr>
<th>Years</th>
<th>Dollars spent in $ Billion</th>
<th>Domestic oil consumption in Billion of gallons</th>
<th>Imported oil consumption in Billion of gallons</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>2.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>3.1</td>
<td>184.4</td>
<td>59.2</td>
<td>245.6</td>
</tr>
<tr>
<td>1975</td>
<td>26.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>93</td>
<td>164</td>
<td>121.6</td>
<td>285.6</td>
</tr>
<tr>
<td>1990 forecast</td>
<td>156.8</td>
<td></td>
<td>93.6</td>
<td>250.4</td>
</tr>
</tbody>
</table>

This resulted in an increase in the price of gasoline on the market:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Price/Gallon</td>
<td>65¢</td>
<td>88¢</td>
<td>$1.2</td>
<td>expected to reach $2 in December</td>
</tr>
</tbody>
</table>

The automobile accounts for 90% of all VMT and this percentage is expected to increase rapidly in the next decade (see FIG-I-3).

Technical progress has been made to increase the fuel efficiency of automobiles; this gain of 5% in urban driving has been offset by a decrease in vehicle-occupancy by 4% to reach the actual rate of 1.31p/car. With all the figures mentioned previously, we can see that a little change in the use of automobile (technical progress toward fuel efficiency, reduction in VMT, increase in car occupancy rate) involves drastic transformations in the total amount of oil consumption. From this
### Figure I-3

<table>
<thead>
<tr>
<th>1990 Population group in thousands</th>
<th>Number of Urban Areas</th>
<th>Population in Millions 1968</th>
<th>Population in Millions 1990</th>
<th>percentage of increase</th>
<th>Annual VMT in Millions 1968</th>
<th>Annual VMT in Millions 1990</th>
<th>percentage of increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 to 100</td>
<td>95</td>
<td>4.66</td>
<td>6.93</td>
<td>48.7</td>
<td>16,100</td>
<td>28,300</td>
<td>75.8</td>
</tr>
<tr>
<td>100 to 250</td>
<td>98</td>
<td>10.18</td>
<td>15.82</td>
<td>55.4</td>
<td>35,700</td>
<td>66,400</td>
<td>86.0</td>
</tr>
<tr>
<td>250 to 500</td>
<td>54</td>
<td>11.69</td>
<td>19.22</td>
<td>64.4</td>
<td>40,800</td>
<td>79,100</td>
<td>93.9</td>
</tr>
<tr>
<td>500 to 1,000</td>
<td>30</td>
<td>13.09</td>
<td>21.82</td>
<td>66.7</td>
<td>46,500</td>
<td>91,100</td>
<td>97.0</td>
</tr>
<tr>
<td>Over 1,000</td>
<td>40</td>
<td>81.48</td>
<td>126.39</td>
<td>55.1</td>
<td>294,300</td>
<td>530,500</td>
<td>80.3</td>
</tr>
<tr>
<td>Total</td>
<td>317</td>
<td>121.10</td>
<td>190.18</td>
<td>57.0</td>
<td>433,400</td>
<td>795,900</td>
<td>83.6</td>
</tr>
</tbody>
</table>
statement, ridesharing appears among the principal means of achieving this goal and others which will be reviewed in the next section (more efficient land use, etc...). But the system represented by the automobile includes different travel patterns and ridesharing, by its evident requirements (join the people together), cannot serve all segments of this vast market. The most cumulative appealing segment is commuter ridesharing (home-work roundtrips) and the following data will support such a choice:

- Commuting accounts for nearly 40% of all automobile trips and consumes 34% (1.8 Million barrels/working day or 75.6 Million gallons/working day) of the daily automotive gasoline consumption.
- The average commuter car occupancy rate is 1.4 (28% occupancy rate) with 74% of commuters driving alone.
- 27% of all automobile commuters travel more than 10 miles to work accounting for 68% of commuter VMT and for more than 20% of all VMT (32.5% if we consider all work trips).

Therefore, this commuter market represents numerous advantages: 1) It is easiest to catch because of cost, boredom and time involved in this kind of trips (70% of all work trips occur in metropolitan areas where congestion and environmental factors make automobile operation especially inefficient and undesirable), and because of the inability of mass transit to serve widely dispersed travel patterns; 2) The market is very prestructured in terms of origins-destinations and time tables for riders; 3) The advantages are of great concern for employees, employers or the community as a whole. (see FIG-I-4 for the repartition of work trips in the day)

A lot has been done already to serve this market and 47% of the nation's automobile commuters ride in private multioccupant cars, carrying about 2.8p/car, the current average occupancy of new carpool being 2.85 instead of an earlier figure of 1.2.

Greater emphasis has been given to the carpool system within paratransit of less formal organization required in comparison to vanpool programs involving more passengers, and because of the travel patterns inside the commuter market. In effect, 51.8% of work trips are 5 miles or less, 71.9% are 10 miles or less (13.8% are 20 miles or more) with an average home-work roundtrip of 19.4 miles. On the other hand, fuel efficiency is easier to achieve through carpool (3 persons in a 40 mile/gallon car represents the same fuel efficiency/passenger as 12 persons in a 10 mile/gallon van).

An evaluation of the principal means of transportation used for work trips in 1979
Percentage of 24-hour trip

- Repartition of work trips in the day -
and which can be compared to the data available from vanpool programs for the same year (7,050 vanpools representing approximately 85,000 persons) makes clear the importance of carpooling within the paratransit system.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Number of people</th>
<th>Percentage of the total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single occupant cars</td>
<td>52,294,000</td>
<td>67.4</td>
</tr>
<tr>
<td>Carpools</td>
<td>15,575,000</td>
<td>20.1</td>
</tr>
<tr>
<td>Mass transit</td>
<td>4,684,000</td>
<td>6</td>
</tr>
<tr>
<td>Others</td>
<td>4,986,000</td>
<td>6.5</td>
</tr>
</tbody>
</table>

More can be done to reduce the 156 Million empty seats travelling every working day and representing a reduction in existing highways efficiency. Incentives to rideshare are directly derived from the advantages inherent to paratransit and particularly from financial returns; but others can be added to accelerate the shift to higher occupancy vehicles. Among them:

- Reducing or eliminating tolls for carpools, vanpools or buspools which offers two advantages for the commuter: 1) financial in the few cases where access to highways require the payment of tolls; 2) time savings by avoiding lines of single-occupant cars (example of implementation: San-Francisco-Oakland Bay-Bridge).

- Construction of preferential or exclusive lanes for high occupancy vehicles (HOV) which is a part of the Transportation System Management (TSM) projects to be federally supported. Two types of implementation exist, each having certain disadvantages: 1) by the construction of one additional lane involving high costs; 2) by closing one existing lane to general use consequently raising public disapproval and the overall number of infractions (50%). In addition, an increase in the quantity and severity of accidents can be perceived in view of greater speed difference between vehicles in the two categories. Already, 50 separate traffic lanes for buspools, vanpools and carpools have been established in 33 cities (Los Angeles,
Honolulu, Miami, Boston, Minneapolis, Washington, etc...)

- Floating working hours allowing the employee the option of permanently shifting hours to adjust to buspool, vanpool or carpool schedules.

- Priority commuter parking, allowing ridesharing commuters to park free near the place of employment (already implemented within numerous states). Price incentives in this direction have limited impact because less than 10% of employees pay for parking at work.

All these incentives and the advantages of ridesharing are necessary to change people's approach to the system of commuting. The comfort and privacy of driving to and from work has become deeply ingrained in their mind, and overcoming this habit will require a considerable shift in attitude. Studies conducted by the Department of Transportation (DOT) show that 60% of the people driving alone to work considered themselves unlikely poolers, the resistance to carpooling being most predominant among older, higher income employees. In any case, if the remaining 40% changed their opinion, more savings would result and the actual percentage would decrease in the time, in view of the more and more negative impact of the automobile.
II) ADVANTAGES OF COMMUTER RIDE SHARING

Many advantages, direct or indirect and of varying importance, benefit the community as well as the individual. The impact of ridesharing is of great concern for 3 groups which in turn play a role in the existence of the system:

1) The community and therefore the government which assumes some responsibility for the implementation and continued operation of the system.

2) Employers or brokers who bear some degree of responsibility in the viability of the system.

3) Individuals who, by adopting or rejecting the system, play a significant role.

The direct or indirect profits represented by ridesharing are channelled towards each of these groups, and tend to have a cumulative as well as interrelated effect. However, a study of these benefits in terms of each individual group is made worthwhile by the distinct positions occupied by each element contributing to the paratransit system.

II-1) The national level

Ridesharing owes its existence to the savings in energy consumption that are derived from a more efficient use of transportation facilities. In fact, the advantages are related and mutually dependent. The following data are for April 1, 1980:

- General consumption -

<table>
<thead>
<tr>
<th>million barrels</th>
<th>day</th>
<th>year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Million Barrels</td>
<td>7.37</td>
<td>2,600</td>
</tr>
</tbody>
</table>

- Energy savings through ridesharing

<table>
<thead>
<tr>
<th>million barrels</th>
<th>working day</th>
<th>year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Million Barrels</td>
<td>0.31</td>
<td>79</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>billion gallons</th>
<th>working day</th>
<th>year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billion Gallons</td>
<td>0.014</td>
<td>3,326</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>million dollars</th>
<th>working day</th>
<th>year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Million dollars</td>
<td>114</td>
<td>27,360</td>
</tr>
</tbody>
</table>
This saving through ridesharing represents approximately 3% of the general consumption of the United States. The increase in the car occupancy rate contributes to fuel reduction in two ways: directly by the decrease in VMT and indirectly by the fact that having a more efficiency oriented use of highways, less congestion results and the remaining one occupant cars can increase their speed in congested corridors.

The consumption curve of a car, as shown in FIG-II-1, indicates that better fuel efficiency occurs when the vehicle is travelling at uniform speeds, between 30 and 40 miles per hour. As traffic flow becomes less dense, another benefit occurs namely in the reduction of automotive costs reflected by lesser wear on brakes and tires (less interruption in traffic flow).

It is also of interest to determine the potential savings of ridesharing in the future in terms of increases in the national occupancy rate, increases in the commuter VMT saved or increases in the number of people joining a carpool or vanpool. The following figures will provide more detail concerning any shift toward ridesharing:

- For an upward shift of 0.1 in the national occupancy rate, 1.8 Million gallons/working day are saved (432 Million gallons/year equivalent to 604.8 Million dollars if we consider a stable price of $1.4/gallon which minimizes the positive financial impact of the shift).

- Value of saving 1% commuter VMT: with an average operating cost of $1.7/mile for a roundtrip of 19.4 miles involving 68,000,000 cars with an average occupancy rate of 1.4, for 240 working days/year, we have the saving of:

\[
\frac{0.17 \times 19.4 \times 68,000,000 \times 240}{1.4} \times 0.01 = 385 \text{ $ Million}
\]

An idea of the potential VMT saving attributed to ridesharing progress as a function of the city size is given in FIG-II-2. Also, these savings can be translated in gallons or dollars (assuming that 1 gallon=$1.4) to obtain the curve denoted by FIG-II-3.

The sprawl of American cities having created low and medium density areas where conventional mass transit is not of sufficient flexibility or financial efficiency, paratransit appeared to be a new, more convenient and rapid service that is tailored to working hours of the people. Labor costs range 65 to 85% of the total annual operating of mass transportation systems and grow faster than revenues, contributing to a more and more important percentage in the annual deficit of mass transit. Generally these costs are avoided in most vanpool programs. In effect, the driver is one of the riders, his compensation consisting of a free ride and the availability of the van during
- FUEL ECONOMY VS VEHICLE SPEED -
FIGURE II-2

Total annual VMT reduction (Million)

- VMT SAVINGS ATTRIBUTED TO COMMUTER RIDESHARING PROGRESS AS A FUNCTION OF THE CITY SIZE
FIGURE II-3

- TOTAL ANNUAL FUEL CONSUMPTION REDUCTION -
non work hours, at a charge/mile determined by contract. In few cases, the driver receives part time compensation involving wages that are not as significant and work regulations not as stringent as those prevailing in conventional transit systems. The improvement of environmental conditions is another important aspect of ridesharing and can be divided into 3 groups of advantages:

-1- Deferral of highway additions, road constructions or fixed rail systems in congested corridors due to a higher efficiency of transportation related facilities. FIG-II-4 shows the optimal freeway capacity increasing with the car occupancy rate in peak hour traffic flow. Therefore, less transit subsidies would be required for new and costly constructions, and could be released for other purposes.

-2- Reduction in parking space requirements in view of better approaches to land use, a lesser amount of land being needed for a same number of riders after an increase in the car occupancy rate. This advantage, directly perceived by the employer will be reviewed in more details later.

-3- Pollution abatement through a reduction in carbon monoxide (CO) and hydrocarbon emissions (HC), due to a small increase in the average speed (see FIG-II-5). Reduction in air pollutants are estimated to be 8,000 tons/year (17,640,000 pounds). Pollution and noise abatement will also help neighborhood revitalization by improving their attractiveness and safety, particularly on high density travel corridors (example: South-End in Boston).

On the other hand, the percentage of accidents on highways is a direct function of their degree of congestion (see FIG-II-6). FIG-II-7 shows the approximate reduction in highway accident costs, depending on the percentage of shift to carpooling. To summarize chapter II-1, we may state that environmental improvements and energy savings constitute the two fundamental advantages derived from ridesharing systems.

II-2) The employees

One of the strongest incentives for an individual to join a paratransit system is the potential reduction in transportation costs. TABLE II-8 gives an idea of the different costs applied to the different modes of transportation available to the commuter. The figure in this table are from 1975 and since that date all operating and capital costs of transportation modes have increased, further altering their specific accuracy in relation to any general observations that may be drawn from the

-18-
In this table, we assume that carpools include cars with 3, 4, 5 persons or more.
- FIGURE II-5 -

HC emissions (grams/mile)  CO emissions (grams/mile)

0  10  20  30  40  50  60  10.5  9.0  7.5  6.0  4.5  3.0  1.5  0

1972  1980  1980

0  10  20  30  40  50  60  70

- RELATIONSHIP BETWEEN AIR POLLUTION EMISSIONS AND SPEED -
- FIGURE II-6 -

Percentage of Accidents

- PERCENTAGE OF ACCIDENTS AS A FUNCTION OF TIME OF DAY -
- FIGURE II-7 -

Savings in $

- REDUCTION IN HIGHWAY ACCIDENT COSTS -
table as a whole. Automobiles with an occupancy rate greater than 3 as well as vans appeared, by far, to be the least expensive means of travel. The driving commuter often perceives only the out of pocket costs in evaluating commuting expenses. Insurance, maintenance and depreciation costs represent a level of underestimation which can amount to as much as 2/3 of the total cost, the other 1/3 representing operating costs. On the other hand, substantial subsidies to buses and fixed rail systems through taxes (property, sales, income and a variety of excise taxes) make the cost of mass transit seem smaller, contributing to misleading conclusions in the evaluation of commuting expenses. This underestimation can be substantial in small cities with low residential and employment densities where mass transit involves higher costs than those mentioned in TABLE-II-8 for larger urban areas.

The costs shown in TABLE-II-8 are indirect costs. They include:
- For the automobile: capital and operating costs of the automobile itself, and of parking facilities, prorated costs to build, maintain and operate highway facilities.
- For the bus system: capital and operating costs of the bus itself, prorated costs to build, maintain and operate highway facilities.
- For the rail system: capital and operating costs of the rail line, costs represented by equipment and stations.

According to a recent survey in Knoxville (Tennessee), a division of cost/mile for the utilization of a standard car would present the following configuration:

Vehicle cost depreciated ( $4.5 ) + Maintenance and accessories ( $3.7 ) + Gasoline and oil ( $5.5 ) + Insurance ( $1.7 ) + State and federal taxes ( $1.6 ) = $17/mile

TABLE-II-9 has been built on this basis to point out the daily, weekly, and annual commuting cost in dollars and their share vis-a-vis average incomes.

To be more precise in defining a more adequate market in terms of home-work distances, and with the purpose of obtaining substantial savings, it is important to conduct a comparison of commuting costs involved in automobile and ridesharing systems. FIG-II-10 provides a reply to this question by reflecting the monthly costs involved in the utilization of automobiles on the basis of single occupancy and triple occupancy as well as vans carrying 8 paying riders, over different round trip distances between home and work. The annual savings, expressed in dollars, resulting from 3 prevailing ridesharing systems over one way home to work distances, are represented by FIG-II-11. Some informations must be added to further explain this figure: travel is on the basis
<table>
<thead>
<tr>
<th>Travel mode</th>
<th>Cost/person in $ for a one way trip of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 miles</td>
</tr>
<tr>
<td>Automobile 1 occupant</td>
<td>2.53</td>
</tr>
<tr>
<td>Rail transit</td>
<td>1.37</td>
</tr>
<tr>
<td>Automobile 1.4 average occupancy</td>
<td>1.81</td>
</tr>
<tr>
<td>Rail transit with park and ride access; half trip on arterial street</td>
<td>1.42</td>
</tr>
<tr>
<td>Busway with park and ride access; half trip on arterial street</td>
<td>1.26</td>
</tr>
<tr>
<td>Rail transit with bus access; half trip on busway</td>
<td>1.12</td>
</tr>
<tr>
<td>Automobile 2 occupants</td>
<td>1.26</td>
</tr>
<tr>
<td>Bus with all trip on arterial streets</td>
<td>0.88</td>
</tr>
<tr>
<td>Automobile 3 occupants</td>
<td>0.84</td>
</tr>
<tr>
<td>Automobile 4 occupants</td>
<td>0.64</td>
</tr>
<tr>
<td>Automobile 6 occupants</td>
<td>0.42</td>
</tr>
<tr>
<td>Van 8 occupants</td>
<td>0.36</td>
</tr>
</tbody>
</table>

Percentage of commuter involved in each group of trip

- ECONOMIC COST OF ONE WAY CBD COMMUTER TRIPS FOR URBAN AREA GREATER THAN 1,000,000 INHABITANTS
<table>
<thead>
<tr>
<th>Distance (one way mileage)</th>
<th>Commuting Cost ($)</th>
<th>Percentage of average annual incomes in $ spent in commuting to work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily (5 days)</td>
<td>Weekly (50 weeks)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(50 weeks)</td>
</tr>
<tr>
<td>5</td>
<td>1.7</td>
<td>8.5</td>
</tr>
<tr>
<td>10</td>
<td>3.4</td>
<td>17</td>
</tr>
<tr>
<td>15</td>
<td>5.1</td>
<td>25.5</td>
</tr>
<tr>
<td>20</td>
<td>6.8</td>
<td>34</td>
</tr>
<tr>
<td>25</td>
<td>8.5</td>
<td>42.5</td>
</tr>
<tr>
<td>30</td>
<td>10.2</td>
<td>51</td>
</tr>
<tr>
<td>35</td>
<td>11.9</td>
<td>59.5</td>
</tr>
<tr>
<td>40</td>
<td>13.6</td>
<td>68</td>
</tr>
<tr>
<td>45</td>
<td>15.3</td>
<td>76.5</td>
</tr>
<tr>
<td>50</td>
<td>17</td>
<td>85</td>
</tr>
</tbody>
</table>

- COST OF COMMUTING TO WORK -
Monthly commuting cost per rider ( $ )

- FIGURE II-10 -

△ = One car, 1 driver
○ = Carpool, 3 members
□ = Vanpool, 8 paying riders + driver

Round trip distances ( miles )

- MONTHLY COMMUTING COSTS PER RIDER -

-26-
Annual savings over driving alone per carpooler (§)

One way distances (miles)

- ANNUAL SAVINGS BY CARPOOLSING PER CARPOOLER -
of $1.4/mile exclusive of parking charges at the place of employment, volunteer driver receiving no compensation, the costs being shared by the carpoolers or vanpoolers, and without any increases in insurance costs as the result of ridesharing.

In a behavioral study made by the Federal Highway Administration (FHWA) of the DOT in August 1978 in the metropolitan area of Washington DC for 800 commuters, it appears that, contrary to common opinion, cost is not the major factor in an individual's decision about carpooling. Carpoolers tend to have a higher income level than solo drivers and when asked why they have joined a pool, 41.8% cited socializing as a reason, 31.5% cited financial savings, 14.6% find carpooling more convenient than driving alone and the remaining 13% stated that no other option was available to them for commuting purposes.

Other advantages directly perceived by the commuter and of varying degrees of interest come into play:

- The need to own two or more cars per family may be eliminated, resulting in significant savings. The substantial increase in the cost of car ownership as compared to all consumer items add more value to this assertion, as indicated by the following data:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>1.01</td>
<td>1.08</td>
<td>1.07</td>
<td>1.39</td>
</tr>
</tbody>
</table>

The Washington survey seems to disprove this possibility, the average number of cars per household being the same (1.9) in the case of solo drivers as well as carpoolers.

- Indirect financial savings by the reduction in car insurance premiums by 10-20% together with a lesser wear on the car, due to a less frequent utilization of the vehicle.

- Possibility of priority parking and carpool lanes causing a gain in time by avoiding traffic congestion that is of great concern for commuters.

- The convenience of the system in comparison with the automobile for different reasons: 1) No fatigue and tension of driving or coping with rush hour traffic providing the opportunity to read, work or sleep during travel time; 2) Door to door service avoiding the need to walk long distances; 3) Reliable means of transportation, particularly in the case of vans where maintenance is carefully assumed by the leasing company or by the driver himself.
But because of the door to door service provided, solo drivers feel that carpoolsing is slower than driving alone in view of the extra time involved in picking-up or dropping-off passengers.

- Carpoolsing provides the opportunity of social exchange, according to the Washington survey; social factors constitute the primary consideration in decision-making in favor of ridesharing. But 85% of the people surveyed said they wanted preliminary contacts with prospective carpool members before making any arrangement, and not to be thrown in a carpool by chance. The intimacy created by carpoolsing can provoke conflicts or disagreements among the riders because they do not want to impose their own rules to the group or because they prefer the anonymous situation of the automobile or even mass transit. The matching programs that bring together prospective carpooiers should adopt more depersonalizing approaches than those used in the computerized systems that are currently employed. Prospective carpooiers prefer to share ride with people having the same professional status. The most prevalent barrier in the acceptance of the system is the lack of independence caused by ridesharing, eliminating for the carpooler the option of leaving home or work at any time (and particularly at lunch hours). This loss of flexibility is also felt by the numerous people who do not know in advance if they will work late or overtime (representing 50% of the employees in Knoxville, Tennessee, for example).

- Carpoolsing provides the satisfaction of alleviating the country's energy, traffic congestion and air pollution problems which, in fact, is of very little concern for potential carpooiers.

- Vanpooling offers the opportunity to ride free to and from work for the driver and to enjoy the use of the van on a low cost per mile basis during non-work hours.

Ridesharing cannot break so easily the image of independence attached to the single-occupant automobile, even if substantial financial savings occur. This balancing between lost of independence and financial gains differs among people depending on backgrounds, attitudes, social levels and population pressures.

II-3) The employers

The most important advantage drawn from ridesharing and which was the original stimulus for the involvement of numerous firms in the promotion and implementation of the
paratransit system, is the saving in the construction and maintenance of parking lots. Because zoning ordinances were designed to ensure that adequate parking facilities were available to each office, many employers were confronted with the consequent costs attached to business expansion. As for highway facilities, we find here again the idea of more efficient land use. Parking space costs can involve very high expenses, the approximate figures being $1,000 for the parking space itself and $15,000 per space for the parking structure in a multistory garage. An evaluation of the reduction in commuter parking spaces in the Central Business District (CBD) area within cities of varying population, as a function of a certain shift to carpooling, is given by the curves of FIG-II-12. This reduction in commuter parking spaces can be translated in a resultant financial saving, assuming that 50% of the facilities involve the construction of structures. Savings will be less important in most cases where firms locate outside the CBD and therefore no special structure are required. For example, the 3M company in Saint Paul (Minnesota) saved $2.5 Million by eliminating the need for 1,500 additional parking spaces (approximately $1,700/space).

Others advantages of less importance benefit the employer:

- Larger potential labor due to the improvement of plant accessibility (ridesharing as a means of transportation if no other option exists, reduction in traffic congestion near the plant). The accessibility to worksite is of great concern for lower salaried employees having problems with car's availability. This improvement can be the stimulus for initiating carpooling or vanpooling as the Erving Paper Mills did in Brattleboro (Vermont) to prevent the loss of highly skilled employees when it moved 25 miles from a previous worksite.

- Improvement in workers punctuality and reductions in absenteism. On the other hand, employees arrive more relaxed at the place of employment by avoiding tension of driving. However, according to a survey conducted in Knoxville (Tennessee), ridesharing does not seem to affect the rate of absenteism.

- Ridesharing enhances the image of the firm because of its actions to conserve energy, reduce pollution and traffic congestion (can benefits of local newspapers or TV coverage).

Three sorts of drawbacks can hinder the existence of employer sponsored vanpool programs (or carpool programs):

- Need for capital outlay to start the program (matching, promotion, etc...). This disadvantage is insignificant when comparing to the returns caused by the reduction
- FIGURE II-12 -

CBD parking spaces devoted to commuter

Savings ($)

85 Million
76.5 Million
68 Million
59.5 Million
51 Million
42.5 Million
34 Million
25.5 Million
17 Million
8.5 Million

City Population (thousands)

- REDUCTION IN CBD COMMUTER PARKING SPACE WITH RIDE-SHARING -
in parking facilities. Some start-up costs for company sponsored vanpools follow and can be compared to FIG-II-12 to obtain an approximate evaluation of the possible benefits to the employer.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Start-up costs ($)</th>
<th>Annual cost/van for maintaining the program</th>
<th>Number of Vans</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 M company St Paul, Minnesota</td>
<td>26,100</td>
<td>229</td>
<td>80</td>
</tr>
<tr>
<td>Tennessee Valley Authority Knoxville, Tennessee</td>
<td>10,600</td>
<td>326</td>
<td>480</td>
</tr>
<tr>
<td>Chrysler Corporation Detroit, Michigan</td>
<td>16,100</td>
<td>256</td>
<td>78</td>
</tr>
<tr>
<td>Continental Oil Company Houston, Texas</td>
<td>40,700</td>
<td>303</td>
<td>37</td>
</tr>
</tbody>
</table>

- Difficulty of assessing liability exposure. This institutional consideration varies among states and shall be reviewed in the next section.
- Possible union pressure to extend vanpooling benefits, leading the employer to lose the overall control of the program.

It emerges from this section that employers receive a substantial return on start-up costs. These costs tend to be reduced by some fiscal advantages that are conceded by the DOT and that will be reviewed in the next section.
III) INSTITUTIONAL CONSIDERATION

III-1) Foreword

With time, impediments to ridesharing pale slowly in the face of incentives, that vary in degree from state to state, initiated at each level of the government. On one hand, regional transportation agencies, by their protectionist attitude towards their transit operations, stemming from a fear of competition by paratransit, do not play the role of brokers for overall transportation needs. This is reflected by the fragmentation and uncoordination of small scale paratransit systems, owned by people more preoccupied by their own operations and short term problems than by issues of long range organization. Conflicting, inconsistent and overlapping regulations as well as institutional obstacles, hinder all forms of commuter ridesharing organization, where restrictive regulations and work rule arrangements of mass transit cannot be applied. On the other hand, after the energy crisis and oil embargo of 1973, the DOT, the Department of Energy (DOE) and the Environmental Protection Agency (EPA) placed commuter ridesharing among the most efficient tools to achieve abatement in pollution and congestion levels as well as enhancing energy conservation. Ridesharing activities belong to the 6 eligible projects that are financially supported within the TSM program. TSM encompasses a broad range of low capital cost improvement strategies whose goals are to have a better utilization and efficiency of highway and transit facilities as well as to achieve many other transportation related goals. In addition, the construction of exclusive traffic lanes for HOVs is one of TOPICS (Traffic Operations Program to Increase Capacity and Safety) -type actions within TSM planning and therefore can be eligible for financial aid.

Institutional considerations play a predominant role in the ridesharing system, at every level, and their impact on service and cost efficiency is not negligible.

III-2) Legislative history of ridesharing activities. Funding.

-1974- The Emergency Highway Energy Conservation Act. Authorized federal Urban system funds to be used at a 90% federal share to fund carpool demonstration projects within $1 Million/year, in urban areas. This act was amended in 1976 to include vanpool demonstration projects and the acquisition of vehicles.
-1974- The Federal-Aid Highway Amendment. Authorized a $7.5 Million carpool demonstration grant program.

-1975- The Energy Policy and Conservation Act. Provides grant funds to states, through the DOE, to implement energy conservation. The funds are divided among all state energy offices based on a formula which includes population and expected energy savings. In March 1980, the DOE, by classifying vanpool as a priority number one vehicle with transit and emergency vehicles, permitted them to obtain gasoline at any time of the day in case of energy shortages. The DOE will probably disappear with the Reagan administration, 1/3 of its employees will be transferred at the DOT.

-1977- The Clean Air Act. Requires that all areas with serious air quality problems, consider vanpooling as an element to attain air quality standards. Funds for planning, developing and implementing ridesharing activities but not capital expenditures are available through the EPA.

-1978- The Surface Transportation Assistance Act. In comparison with The Emergency Highway Energy Conservation Act, it authorized the use of more funds, removed the "demonstration" feature from these projects but reduced the federal share from 90% to 75%. According to the Act, all efforts to promote carpooling and vanpooling programs must not adversely effect conventional mass transportation. Those which can receive federal Primary, Secondary and Urban system funds are:
   - manual or computerized systems for matching purposes.
   - work necessary to designate highway lanes as HOV lanes.
   - preferential parking for carpools.
   - public information and promotion expenditures.
   - acquisition of vanpool vehicles for a vanpool program.

Although nothing has yet been implemented by the Reagan administration in this area, cuts in various sources of funding affecting particularly Secondary and Urban system funds are being anticipated. A specific budget, clearly defined for specific period, would be allocated for each state according to population density and for the purpose of promoting ridesharing.

-1978- The Energy Tax Act. Allows the employer a 10% investment tax credit on the purchase price of new vans in the event that the employer sponsors a vanpooling program.

-1979- The formation of The National Task Force on Ridesharing, on former President Carter's initiative, resulting in:
- The establishment of the national ridesharing information center within the DOT to provide information to the public and private sectors.
- The formation of a team of ridesharing experts from the private and public sectors to share their expertise and to continue the dialogue between the two parties.
- The submission to Congress of an Auto Use Management Plan providing funds for the construction of exclusive highway lanes for HOVs.
- The establishment of an Executive Loan Program to help organizations start or expand ridesharing activities through an interest-free loan program for the purchase of vans.
- The preparation of a "Model Ridesharing Law" for state legislators to help overcome regulatory barriers that restrict formation of carpools and vanpools in such areas as licensing, registration, inspection, safety and insurance requirements as well as fares, number of passengers, etc.
- The administration of a $5 Million ridesharing demonstration program including 17 projects in 16 states and the training as well as the providing of technical assistance to states and local ridesharing agencies.

1980 - A bill to be enacted by the Senate has the objective of creating a National Office of Ridesharing. The purpose of this office would be to develop a national ridesharing program to assist states, counties, municipalities, Metropolitan Planning Organizations (MPOs) and providers of ridesharing services, publicly or privately owned, in developing and implementing ridesharing systems. The National Office would also coordinate these programs with other ridesharing activities within the DOT, the DOE and other branches of the federal government to ensure the integration and complementarity of ridesharing with conventional mass transit systems.

1980 - The Commuter Transportation Energy Efficiency Act. It encompasses:
- A tax incentive to the individual who buys a van for ridesharing purposes (15% tax credit based on the cost of the van).
- The exclusion from the taxable income of the employee, in case of an employer-sponsored program, of any payment made by an employer to the employee as a subsidy for the cost of vanpooling or carpooling.
- The exclusion from taxable income of the fees collected by the driver from the riders.
- The increase of the tax incentive for businesses purchasing or leasing vans for use in employer-sponsored ridesharing programs, from the actual 10% to 20% and
the extension of this tax incentive to third parties, as well as the inclusion of administrative overhead costs (personel, adjustable working hours, parking, etc...).
- the exclusion from the 80/20 rule (80% of the van's mileage must be used for ridesharing, the remaining 20% can be used by the driver) of the driver incentive mileage and its replacement by a 50/50 rule.
- a gasoline tax deduction for the gasoline used in ridesharing vehicles.

A National Association of Vanpool Operators (NAVPO) was also created to represent the majority of employer and third party sponsored vanpool programs and to provide information and assistance for ridesharing programs.

In 1975, metropolitan areas were asked, before receiving funds for any local transportation activity, to examine their existing urban transportation needs and resources and to develop a plan of low-cost transportation improving the effectiveness of existing facilities. The plan has to be approved by the UMTA and the FHWA to receive Federal Primary, Secondary or Urban System Highway funds. According to what has been said previously, the funds can be used with a federal share of 75%, the remaining 25% coming from the States. But highway revenues have grown at a much slower rate than highway construction, maintenance and operation costs, resulting in a budget squeeze that constrained the allocation of monies to many new functions such as ridesharing. Since 1974, approximately $68.3 Million in federal highway funds have been spent by States and urban areas for ridesharing projects and the repartition is as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ 6,467,657</td>
<td>$ 2,815,005</td>
<td>$ 1,301,557</td>
<td>$ 2,740,496</td>
<td>$ 13,397,778</td>
<td>$ 41,530,752</td>
</tr>
</tbody>
</table>

A survey to evaluate the effectiveness of federally funded carpool demonstration projects give the following results:
- An annual travel reduction of 12,673,000 VMT or 1.2% of areawide total worktrip VMT
- Annual energy conservation of 986,000 gallons
- An annual vehicle operation cost reduction of $1,087,000
- A reduction in demand for commuter parking by 1,009 emplacements.

The major source of funding is the FHWA, closely followed by State, local, and UMTA sources. Funds from the DOE, the EPA and other financial sources combined constitute 16% of the program budget.
III. Legal impediments to ridesharing activities

Numerous institutional obstacles have impeded all forms of commuter ridesharing for years and still constitute major negative factors in the decision making by prospective poolers as well as ridesharing sponsors. With the preparation of a "Model Ride-sharing Law" in October of 1979 as a part of the "National Task Force on Ridesharing" program established in order to help State legislators in dealing with the problems inherent to the creation of pooling programs, a great step forward has been taken. Laws vary with States and sometimes within the State when judicial branches of the government can exempt certain ridesharing arrangements even though the legislature had not acted in this way. If the government hopes to encourage massive commuter ridesharing, regulations must be modernized, simplified, easily accessible to the public and generalized as far as possible.

The problems emerging with any pooling arrangement encompass a broad range of subjects: charge acceptable by the driver, insurance, workmen's compensation, interstate regulations, tax status, classification of commuter service, driver liability, zoning regulations, etc.

It is not very easy to explain the procedure by which the problems are treated because of the varying positions held by the States vis-a-vis ridesharing arrangements. In spite of this complexity, we can have a better understanding of the different approaches adopted by State courts through a rapid review of their different positions with the help of TABLE-III-l and its appendages.

Income-Tax status- Before speaking of the tax liabilities affecting fees collected by the driver from the riders, we have to specify that, in some States, the pooling arrangement must be "non-profit" (2'' of TABLE ). Within that category, the interpretation of the term "non-profit" differs: some maintain that payment up to $20/mile is non-profit while others stipulate that compensation must be "reasonable" more or less allowing for depreciation costs on the vehicle. Sharing only operating costs is not very equitable when we know that they can represent 2/3 of the total cost. For States allowing the driver to receive an income, regardless of the expenses associated with the ridesharing arrangement, the question of tax treatment emerges and leads to three possible configurations:

1) Some States do not levy a tax on such ridesharing income if the pooling arrangement does not result in profit (6 of TABLE ).

The other States do impose a tax on personal income but no tax treatment of ridesharing arrangements has been enacted by any State legislature. All depends on the State defini-
<table>
<thead>
<tr>
<th>State</th>
<th>1</th>
<th>2'</th>
<th>2''</th>
<th>2'''</th>
<th>2'***</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>10</td>
<td>*</td>
<td>**</td>
<td></td>
<td></td>
<td>*</td>
<td>10/C</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Alaska</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10/C</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Arizona</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15</td>
<td>15/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Arkansas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NBO</td>
<td>****</td>
<td>0</td>
</tr>
<tr>
<td>California</td>
<td>15</td>
<td>*</td>
<td></td>
<td>1/D</td>
<td></td>
<td></td>
<td>10</td>
<td>****</td>
<td>0</td>
</tr>
<tr>
<td>Colorado</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Connecticut</td>
<td>15</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
<td>RDP</td>
</tr>
<tr>
<td>Delaware</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Florida</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
<td>0</td>
</tr>
<tr>
<td>Georgia</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NCC</td>
<td>****</td>
<td>0</td>
</tr>
<tr>
<td>Hawai</td>
<td>15</td>
<td>*</td>
<td></td>
<td>1/D</td>
<td></td>
<td></td>
<td>10/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Idaho</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>10/C</td>
</tr>
<tr>
<td>Illinois</td>
<td>12-15</td>
<td>*</td>
<td>**</td>
<td>ESR</td>
<td></td>
<td>*</td>
<td>C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Indiana</td>
<td>7-16</td>
<td>*</td>
<td>**</td>
<td>ACC</td>
<td>1/D</td>
<td>*</td>
<td>10/C</td>
<td>**</td>
<td>0</td>
</tr>
<tr>
<td>Iowa</td>
<td>8-15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
<td>0</td>
</tr>
<tr>
<td>Kansas</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td>10/C</td>
</tr>
<tr>
<td>Kentucky</td>
<td>15</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESP</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Louisiana</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10/C</td>
<td>****</td>
</tr>
<tr>
<td>Maine</td>
<td>12</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Maryland</td>
<td>15</td>
<td>*</td>
<td>**</td>
<td>ESR</td>
<td></td>
<td></td>
<td>10/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Massachusetts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td>8/C</td>
</tr>
<tr>
<td>Michigan</td>
<td>15</td>
<td>*</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>10/C</td>
</tr>
<tr>
<td>Minnesota</td>
<td>7-16</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
<td>8</td>
</tr>
<tr>
<td>Mississippi</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
<td>0</td>
</tr>
<tr>
<td>Missouri</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2'</td>
<td>2''</td>
<td>2'''</td>
<td>2''''</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>----------------</td>
<td>----</td>
<td>----</td>
<td>------</td>
<td>------</td>
<td>-------</td>
<td>-----</td>
<td>------</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Nebraska</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td>10/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Nevada</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>****</td>
<td>10</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>15</td>
<td>**</td>
<td>NCC</td>
<td></td>
<td></td>
<td>L</td>
<td>***</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>New Jersey</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
<td>C</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>New Mexico</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>10/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>New York</td>
<td>**</td>
<td></td>
<td>AOC</td>
<td></td>
<td></td>
<td>***</td>
<td>15/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>North Carolina</td>
<td></td>
<td>*</td>
<td>AOC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>North Dakota</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td>10/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Ohio</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>**</td>
<td>9</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td></td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Oregon</td>
<td></td>
<td></td>
<td>NCC</td>
<td></td>
<td>AOC</td>
<td>***</td>
<td>C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
<td>10/C</td>
<td>**</td>
<td>0</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td>RDP/7</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>South Carolina</td>
<td></td>
<td></td>
<td>NBO</td>
<td></td>
<td></td>
<td>***</td>
<td>10/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>South Dakota</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>****</td>
<td>RR/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Tennessee</td>
<td>15</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td>10/C</td>
<td>***</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Texas</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>***</td>
<td>C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Utah</td>
<td>5</td>
<td>*</td>
<td>ESP</td>
<td></td>
<td></td>
<td>***</td>
<td>10</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Vermont</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RR/C</td>
<td>7</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Virginia</td>
<td>12</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
<td>****</td>
<td>1/D</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Washington</td>
<td>16</td>
<td>*</td>
<td>NCC</td>
<td></td>
<td></td>
<td></td>
<td>RR/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>West Virginia</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7/C</td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
<td>***</td>
<td>0</td>
</tr>
<tr>
<td>Wyoming</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10/C</td>
<td>***</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>D.C.</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10/C</td>
<td>***</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

-39-
1) * States with no exemptions for ridesharing arrangements if motor carrier laws do not apply (the trip must be to and from work and this does not constitute a problem for commuter ridesharing arrangements).
   ** States whose sole exemption is the requirement that the riders share of trip expenses do not exceed the operating costs of the van.

2) States with specific criteria for ridesharing arrangements such as:

2') Number(s) The pool must not exceed a specific number of passengers.
2'') * Trips are restricted to home-work round trips.
2''' ** The ridesharing system must be non-profit.
2'''') Miscellaneous criteria such as:
NCC  There must be no competition with conventional mass transit.
NBO  The driver must be a volunteer and not a full time worker.
I/D  One trip per day allowed.
ESR  Employer must not own or lease the ridesharing system.
AOC  Approval by the motor carrier regulatory agency is required.
ESP  Employee must not own the ridesharing system.

3) Type of insurance:
   * States with guest statutes.
   ** States with guest statutes that have been declared invalid by the courts.
   *** States with no fault laws "following the vehicle".
   **** States with no fault laws "following people".

4) States defining a bus as a motor vehicle with the adjunctions following: the vehicle transports more than a certain number of passengers (number); with compensation (C), on a regular route (RR), or it has a certain length (L) or receives or discharges passengers (RDP). The States which are not mentioned in the TABLE do not have any definition for buses.

5) Fair Labor Standard Laws and ridesharing:
   * States that exempt commuting time.
   ** States that empower an administrative agency to promulgate rules.
** States that do not exempt commuting time.
**** States that conform entirely to FLSA.

6) State Income tax laws:
   0 States that do not impose a tax on personal income derived from ridesharing.
   00 States that follow or adapt the Internal Revenue Code statutes.
   000 States having statutes defining income that differ substantially with Internal Revenue Code statutes.
tion of "taxable income". In other words, it is important to know if they follow the one adopted by the Internal Revenue Code. The Internal Revenue Code states that income received by the driver in the case of a non-profit, to and from work, ridesharing arrangement does not constitute a taxable income. Therefore, two other categories are added:

2) States that adopt or follow the Internal Revenue Code's definition as the basis for calculating personal income taxes (6 of TABLE)

3) States that do not follow the Internal Revenue Code's definition (6 of TABLE). Another problem appears when the ridesharing arrangement has been certified as a common carrier because, at this time, rates may be accordingly regulated (4 of TABLE for the definition of common carrier).

Insurance - 4 types of positions can be held by the States in what concerns insurance categories applied to ridesharing arrangements (3 of TABLE):

1) States with guest statutes that involve a liability policy compensating persons injured as a result of vanpool owner's or driver's negligence.

2) States with guest statutes that have been declared invalid by the courts. In this case, the courts decide on the validity of insurance arrangements for each specific case.

3) States with a no fault policy "that follows people" where the carpooler who does not own the vehicle is covered by his insurance company regardless of fault.

4) States with a no fault policy "that follows the vehicle" where the carpooler who does not own the vehicle is covered by a policy covering the vehicle regardless of fault.

If the ridesharing arrangement has been certified as a common carrier (4 of TABLE), expensive insurance requirements could be applied. At this time, small employee or employer sponsored programs are unfavourably affected in comparison to large scale employer sponsored programs where companies can afford to be self-insurers. In an other direction, State laws have not addressed the issue of providing workmen's compensation for employees involved in ridesharing while courts have done so. The problem of workmen's compensation involves the liability of the employer vis-a-vis his employees who are injured when ridesharing to or from the worksite. States have adopted a law exempting of compensation any driver or passenger in a voluntary vanpool or carpool program even though they ask the employer to provide minimum levels of compensation to employees injured out of, while or in the course of employment.

Labor standards - The complexity of institutional problems appears clearly in the resolution of the following question: must commuting time by drivers or riders be counted as compensable hours of work, and at this point be calculated at overtime rates? The Federal Fair Labor Standard Act (FLSA) stated that vanpools would not be engaged in compensable
work time when the driving is purely voluntary and the employer gains no profit from
the pooling arrangement. But many employers are not covered by FLSA, and on the other
hand, the courts are not obliged to follow the Fair Labor Standard laws. 4 categories
can be drawn at this point (5 of TABLE):
1) States that expressly exempt commuting time. In this case, transportation to and from
work does not constitute any part of the employee's work hours, even if the employer
is covered by FLSA.
2) States that empower an administrative agency to promulgate rules for employee com-
    pensation, even if the employer is covered by FLSA.
3) States that require employers to pay vanpool drivers for commuting times, the empl-
    oyer being covered by FLSA or not.
4) States that conform entirely to Fair Labor Standard laws.
A myriad of other miscellaneous institutional obstacles can hinder ridesharing arrange-
ments. The following may create obstacles (4 of TABLE):
- transportation on a route that is served by mass transit, being either bus transit or
  rail transit (no competition with mass transportation).
- the regulation of schedules, high registration fees as well as the requirement of spe-
  cial records and special equipment if the ridesharing program is certified as a common
  carrier.
- the definition of the number of passengers to be transported, of a route to be followed
  (home-work roundtrip) and of the number of trips per day.
- the special licensing required for van operation in the case of transportation services
  involving compensation, resulting in lost time and expenses.
- the interdiction for the driver to operate the van for part time or full time compen-
  sation.
Ridesharing involves numerous institutional problems which must be approached, but sim-
plification and easy accessibility to the public are needed to promote the system. The
lack of position concerning specific questions by the courts, the rigour of certain laws,
the confusion created by the complexity of certain procedures have beset all forms of
ridesharing activities. Progress, of varying degrees depending on the States, has been
made, but still, institutional problems can constitute significant obstacles for the ini-
tiation of ridesharing programs.

III-4) Operating modes for ridesharing systems—The brokerage approach

Before defining the different approaches to ridesharing activities, common requirements can
be developed to have a better understanding of the pooling infrastructure. We can order the different and essential steps to be taken during the program in the following way:

-1- Coordination and management must be assumed by someone to permit the achievement of the next steps in the program as well as to formally represent the pooling arrangement.

-2- Promotion and information are undertaken to associate a maximum number of people in the system for purposes of higher efficiency.

-3- The prospective poolers, after having manifested their interest in the system, are gathered to give to the coordinator complete information about place of employment, residence, working hours, preferences concerning the types of people with whom they would like to share the ride and if they are available to drive the vehicle.

-4- Matching is then necessary to avoid excessive travel time that will occur if pick up or delivery emplacements are too distant as well as to take the preferences of the prospective poolers into account. Depending on the scale of the program, matching systems can either be manual or computerized.

-5- Another meeting of the commuters interested in the program is necessary to get their final decisions after preliminary conversations between those involved in the same pool. In this meeting, fares as well as the rules to be observed within each pool ( rider agreement ) will be discussed and established.

-6- Then, the vehicle to be shared will be bought or leased depending on the results of the arrangements between the coordinator and the poolers.

-7- At this point, the system is initiated and its continuation must be achieved. For that, the driver keeps records of the fares collected from the riders, of the expenses involved in maintaining the vehicle, of the number of persons leaving or joining the system, etc... Information and promotion never stop in order to fill places by those leaving the pool, and to complete or create other pooling arrangements.

The scale of the ridesharing program determines the importance to be given to each step. For example, a spontaneous carpool, because it generally involves friends or neighbours, does not require an organization as formal as vanpool organized on the initiative of an employer.

Ridesharing programs fall into 3 major operating modes, depending on the sponsor of the pooling arrangement:
1- Employer sponsored programs. In this mode, the process followed is the one that approximate most closely the model previously described. Promotion and information do not constitute a problem in this case because of the concentration of potential poolers in the same place, having the same requirements in terms of schedules and destination and because of the numerous possibilities of information available in a firm. The expenses involved in the initiation and continuation of the program can be financed under the Surface Transportation Assistance Act (see chapter III-2). Because of the many advantages drawn from ridesharing by the employer, as reviewed in the previous section, the employer sponsored mode was adopted at the outset of ridesharing activities with the 3M Company in St. Paul, Minnesota (130 vans). The Tennessee Valley Authority (TVA) in Knoxville, Tennessee (399 vans) and the Continental Oil Company (CONOCO) in Houston, Texas (189 vans) are among the most important on a list that encompasses a growing number of such arrangements since 1973.

2- Driver owned and operated programs. This type of program often applies to small scale informal organizations involving generally friends or neighbors, making it possible to attach less importance to the different steps of the model. Word of mouth is the predominant means of promotion and information in spite of the availability of the means a firm can provide. Some State energy offices or regional transit authorities provide computerized matching systems to help individuals in the realization of the program, but in most cases, simple manual matching is sufficient. The major drawback with this type of organization lies in the purchase or leasing of vehicles requiring, either a subsequent capital outlay or an increase in the fares due to high interest rates charged by banks or credit unions. This disadvantage is avoided in cases of spontaneous carpools where the vehicle generally belongs to one of the poolers. The fact that a few people, knowing each other, decide to organize and manage a small scale ridesharing system, serves to diminish the chance of failure within a short term period.

3- Third-party sponsored programs. The third-party or broker's responsibility is to identify the specific travel needs of various market segments and to match them with the appropriate and lowest cost resources available. This neutral organization can be a new organization, public or private, profit or non-profit or a regional transportation authority that ensures the coordination of transportation services (integration) in order to avoid any competition. Therefore, the broker's role is to take all the steps of the model previously
described, in the formal way prescribed by their profession. In other words, they will take care of promotion, ride matching, driver selection and training, record keeping, accounting, van purchase or leasing, insurance and etc... The pooler will only have to give the information needed to this organization and to pay a certain amount per month in return for the service provided. The advantages of the brokerage mechanism which saw its first implementation in Knoxville, Tennessee in 1976, go far beyond the few drawbacks that can be drawn and can be described as follows:

- The corporation, by identifying individuals with similar travel needs in terms of destination and work times, can influence their travel choice by providing motivation and incentives inherent to ridesharing systems. In a certain way, this increases the number of prospective poolers because of a good promotion and well founded information.

- Many employers or individuals cannot afford to organize, initiate and ensure the continuation of ridesharing programs because of the time and capital outlay required. On the other hand, 25% of the labor force works in a firm with at least 500 employees per site, the remaining 75% must be served by a transportation broker if they want to rideshare because of the lesser probability that their employer would be able to organize viable programs. The brokerage mechanism permits the employer to avoid the administration of a service he cannot afford and in which he is not a professional. Through this way, multi employer locations can be served by para-transit services where otherwise difficulties would exist.

- By ensuring the coordination of transportation services, matching "needs" with resources and administering as far as possible travel demands, the broker can help social agencies in recovering disparate sources of funding and decreasing their administrative task to meet the travel needs of the transportation disadvantaged. A State created agency, the Delaware Authority for specialized Transportation (DAST) and an organization of 40 service providers in Chattanooga, Tennessee illustrate a brokerage approach more oriented towards human services.

The major drawback that can be drawn from this system is the increase in rider fares in comparison to those involved in employer or employee sponsored programs. More complex organization leading to higher overhead costs, possible higher insurance premiums, more state and federal regulation constraints, constitute the prevalent reasons for this increase. In spite of this, the numerous advantages inherent to ridesharing systems and benefiting the individual, still exceed the costs involved with such type of organization. In addition, the brokerage system can permit the creation of more rides-
sharing arrangements that would never appear otherwise. Most third-party programs operating today are managed by private, non-profit organization such as RIDES in San Francisco, California or the Knoxville Commuter Pool in Tennessee. But the government has also promoted the brokerage concept by creating agencies in Chicago or Pittsburg for example as well as financially supporting non-profit organizations such as the one in St Paul, Minnesota. As mentioned in section II of this study, the nation as a whole draws consequent advantages from ridesharing systems which leads the government to take some responsibilities in the promotion of the brokerage system in order to procure travel options for everyone or, at least, to respond to travel needs.
IV ) Ridesharing and its application to France

Although neither marketing nor specialized studies have been developed to analyze the attitude of people towards an implementation of ridesharing activities in France, some remarks concerning the differences between the two contexts and the way they will affect any possible application will be discussed. The following remarks will clarify some influencing factors inherent to the French context:

- A different configuration of cities as well as a more developed mass transit system leading to more travel needs satisfied in less dispersed travel patterns, have created a better image of conventional mass transportation among the public that the one existing in the United States. A wider utilization of mass transit has resulted in the generation of more competition vis-a-vis ridesharing systems although, in the United States, potential poolers and public mass transit riders do not belong to the same market segment. It is difficult to assume in the absence of previous surveys that, in France, ridesharing activities will not divert riders from high occupancy means of transportation. To reap advantage from the American experience in the field, paratransit will have a better chance of success if applied to wide metropolitan areas not adequately served by mass transit and where problems of traffic congestion remain unresolved. The latter requirement has appeared to constitute a predominant stimulus for American solo drivers to shift to more convenient and less stressful carpooling or vanpooling programs.

- The more centralized character of the means of public information in France will not facilitate the promotion of ridesharing. In effect, pinpoint advertising campaigns, as those appearing in local newspapers or TV broadcasting, play an important role in commuter decision making. Some national operations, like those involving driving techniques leading to greater fuel efficiency, are made possible by the large number of people to be addressed. Specific incentives, advantages and problems inherent to a certain type of organization in a certain area will be difficult to broadcast through the French media and even if such broadcasts were to be made, the impact on the population is likely to be less marked. The degree of centralization to be found within the system of information diffusion in France would also manifested itself at the level of any prospective regulations pertaining to ridesharing systems. In terms of regulatory constraints as well as funding, potential ridesharing activities in France are likely to be less complex. Consequently, promotion campaigns would not be as area specific as those in the United States.
The behavioral study conducted in Washington DC in 1978 by the FHWA of the DOT has shown the importance attached to social factors in ridesharing. According to that study, 41.8% of prospective poolers cited socializing as a reason to join a pool whereas only 31.5% cited financial savings. Although there are good reasons to think that French people will be more sensitive to financial savings than American currently are, the question of personal contacts will remain predominant. It is current knowledge that first contacts are more formal and less relaxed in France, resulting in two considerations: 1) Inhibition of that kind will not favor the public acceptance of such arrangements and 2) special care will have to be devoted to the ride-matching system as well as to preliminary meetings between poolers.

Ridesharing systems have a better chance of success if applied to large scale firms in view of the more important number of potential poolers to be found in the same emplacement and with the same working hours. In France, many large firms already possess their own network of transportation for the picking up and dropping off of their labor force. In such a context, ridesharing will come up against existing systems where, in addition, transportation costs are chargeable to the employer. Unions may not well perceive a new system involving expense to workers while presenting no interest.

On the other hand, while in the United States the success of the experience depends on the cooperation of employers, in France, the acceptance of the unions would be required. In effect, unions have the power to mobilize numerous workers if the participation was not to appear as a collaboration with the body of employers. A dialogue will have to be established between unions and the government, the employer being more or less swept along by the movement. The commitment of labor unions to this dialogue would be facilitated by their perception of possibilities for self management in problems of worker transportation. It is important to note however that such arrangements would not, in the view point of unions, substitute for transportation policies addressing travel needs at all levels of society. At the present time, unions have extended their involvement to areas beyond the field of professional problems.

To summarize this paragraph, we can state that two factors will influence ridesharing activities at the level of the firm:

1) The existence of well established and appreciated commuting systems among firms hinders appreciably the addition of a new organization at an experimental stage.

2) The unions through their capacity to mobilize the workers and by the extension
of their field of intervention, play an important role in the acceptance of the system.

Financial savings are expected to weigh substantially on the side of ridesharing, in France, for several reasons:

* The percentage of the average income spent on commuting is higher because of several factors including:
  1) A lower standard of living
  2) Higher operating costs for vehicles (approximately 2 times greater) due to the price of gasoline (around $3/gallon) even if the greater fuel efficiency of French cars is taken into account
  3) A higher capital cost for vehicles due to higher purchase prices (the ratio being approximately 1.5 in comparison to the U.S.), higher insurance premiums and taxes ("vignette")

A less important commuting distance constitutes the only factor that could reduce the share of income devoted to such expenses.

* A lower standard of living together with a higher capital cost of automobiles reduces the availability of vehicles. This has contributed to a wider utilization of mass transit without satisfying all travel needs because of the impossibility for HOVs to serve all travel patterns even if they are less dispersed in France.

* When considering the depreciation of a vehicle, French people attach more importance to the mileage while, in the United States, the age of the car prevails. Therefore, this saving in the market value of the car due to a lesser utilization can be more perceived in France.

* Although many efforts have been made by the French government to acquire a certain energy independence vis-a-vis foreign crude oil through the development of nuclear energy, 56% of French energy consumption is still imported. Any decrease in this percentage will reduce the negative impact (unemployment, inflation, etc...) that results from this excessive and costly dependence.

Two important points based on an existing configuration and not on studies of prospective attitudes emerge from the previous remarks:

- The shape of cities (less sprawled) together with a better network of transportation means provided either by mass transit or by specialized transportation for commuters working in large firms constitutes a major negative factor in decision making about ridesharing systems.

- A low standard of living together with high operating and capital costs for vehicles
increase substantially the financial interests of ridesharing activities. Therefore, it is difficult to forecast precisely the behavior that French commuters will adopt in the face of paratransit and particularly in the absence of more extensive research. Marketing, promotion techniques, behavioral studies, dialogues with unions and employers, etc... are necessary to evaluate the importance to be attached to ridesharing systems in France.
V ) Conclusion

One of the predominant reasons for the encouragement of ridesharing systems lies in the potential energy savings to the nation. In spite of a reduction of 3% in energy consumption in 1980 with an 8% decrease in petroleum consumption, Americans still continue to consume 1/3 of the world energy and do not believe in long term shortages. They focus their attention more on the development of new energy sources as well as on a more extensive working of actual oil and coal fields than on means of reducing consumption. The important coal resources of the American subsoil (Merker and Rifle), the possibility of great hydrogen production through the electrolysis of water that can be combined with coal to produce a synthetic fuel more efficient and less polluting than gasoline, the working of oil fields considered as depleted and now optimized by the development of computerized techniques, and the development of new energies and particularly of solar energy have enforced this state of mind. But commuting expenses can still represent a large share of average income and on the other hand, any means to reduce even moderately the consumption of energy should be considered, encouraged and organized, especially if other substantial advantages can be derived from such means. Given these forecasts, the shape of cities and the independence derived from private low occupancy vehicles, the automobile is expected to continue to be the basic mode of transportation in the United States. 3 principal ways of reducing fuel consumption are currently in process of development: technical improvements in engine efficiency, speed limit and ridesharing systems. The estimate energy savings by 1985 from these selected conservation measures are as follows:

<table>
<thead>
<tr>
<th>Conservation measures</th>
<th>Savings (barrels/day)</th>
<th>Savings (% of actual total fuel consumption)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile fuel economy standards</td>
<td>1,595,000</td>
<td>21.70</td>
</tr>
<tr>
<td>55 miles/hour speed limit</td>
<td>302,000</td>
<td>4.23</td>
</tr>
<tr>
<td>Ridesharing</td>
<td>262,000</td>
<td>3.55</td>
</tr>
</tbody>
</table>

-52-
The Reagan administration has indicated a willingness to restore the speed limit to 70 miles/hour. This would negatively influence fuel economy even if a greater traffic fluidity was to be achieved, and bring about a rise in car accidents. As been said previously, ridesharing contributes by approximatively 3% (or $27.36 Billion) in fuel conservation at the present time and this figure is expected to reach 3.55% by 1985.

Therefore, it is important to have a better understanding of the forces that influence ridesharing for purposes of adopting adequate strategies that will encourage the development of paratransit. Although there is no best way to structure a ridesharing program, each situation being unique, the existence of an organization that will ensure the integration of system and service components as well as remove the obstacles that may impede pooling activities, seems to be required. At the present time, authorities for managing transportation services are dispersed among a number of public and private agencies that operate in most cases independently, depending on States. In connection with this, different sources of funding are available to ridesharing activities where different regulation constraints apply. A region-wide multimodal transportation agency would be more able to make the most efficient use of transportation resources to ensure mobility for the widest number of population segments. 4 types of organizations emerge: volunteer, non-profit, profit making and governmental. Several factors including the possibility of a regular source of funding, the facility of obtaining legislative changes as well as the possibility of full participation in the transportation planning process, place governmental agencies in the best position to ensure mobility within a wide range of modal options.

The most important goals to be achieved by this governmental broker are as follows:

- To provide a wide range of different service alternatives to satisfy numerous travel demands. Population densities and vehicle occupancy rates are mutually dependent: high occupancy modes for high density travel corridors and demand responsive services in low density areas.

- To ensure the coordination of the different modes to avoid overlapping. This is more easily achieved by a public organization given the search for profit maximization by private agencies that operate in a competitive environment.

- To encourage any form of pooling arrangement by protecting passengers in terms of liability exposure, safety, fares as well as protecting drivers in terms of working conditions, and to take into consideration the forces that influence positively the development of ridesharing. A well-founded information system, a personalized mat-
ching system as well as the development of incentives and the simplification or suppression of certain regulation constraints are among the key points this agency will have to deal with.

In what concerns the commuter market, requisites for success are 3 in number:

1) Size of the firm (important number of employees required).
2) Regularity of work schedule.
3) Geographic distribution of the labor force (residential concentration of employees required).

Spontaneous carpooling captures 1/3 of the commuter market because of its less formal organization and its financial advantages for short home-work round trips in comparison to vanpooling. This percentage may decrease with the measures taken in vehicle construction to improve fuel economy. In effect, the propensity towards ridesharing is expected to decrease as the result of vehicle downsizing and reduction in operating costs. Ridesharing has proven its ability to reduce by 3% the total fuel consumption of the United States as well as to diminish parking space requirements, defer transportation facilities additions, abate pollution levels, provide the opportunity for social exchanges between employees, increase the potential labor force for employers and above all permit financial savings. On the other hand, the increasing deficit of conventional mass transit together with the importance attached to the automobile in spite of growing operating costs as well as the common desire to simplify the legislation and the organization of pooling arrangements, lead to think that ridesharing will continue to make an increasing contribution to fuel economy.
- TSM...and Federal-Aid Highway fund for transportation improvements
  DOT  . July 1979

- Incentives and disincentives for ridesharing. A behavioral study
  DOT  . August 1978

- Transportation role in neighborhood revitalization
  DOT  . February 1978

- Vanpooling...an update
  DOE  . September 1979

- How to pool it
  DOT  . May 1975

- L'incitation a l'utilisation collective de la voiture particulière
  Institut de recherche des transports  . Janvier 1980

- The Valley Transit District
  DOT  . February 1979

- Vanpooling, the 3 major approaches
  DOE  . August 1979

- Legal impediments to ridesharing arrangements
  DOT  . December 1979

- Manual carpool matching methods
  DOT  . January 1974

- Evaluation of carpool demonstration projects
  DOT  . October 1978

- Vanpooling demonstration project
  DOE  . May 1978

- Comparaison of organizational and operational aspects of 4 vanpool demonstration
  projects
  DOT  . April 1979

- New approaches to successful vanpooling. 5 cases studies
  DOE  . May 1979

- Increased transportation efficiency through ridesharing: the brokerage approach
  DOT  . January 1977

- Ridesharing: meeting the challenge of the 80's
  Report of the national task force on ridesharing  . 1980
- Transportation system management. Evaluation of carpool demonstration projects
  DOT . October 1980

- Vanpool implementation handbook
  DOE . 1980

- Low cost urban transportation alternatives
  DOT . January 1973

- Innovation in public transportation
  DOT . 1979

- How ridesharing can help your company
  DOT . May 1980

- How to put together a vanpool
  DOT . December 1977

- Transportation agenda for the 1980's: Issues and policy directions
  DOT . 1980

- Report of the secretary of transportation to the United States Congress
  DOT . May 1980

- The future of the automobile
  Daniel Roos-Director MIT Center for Transportation Studies . October 1980

- Energy conservation in transportation
  DOT . May 1979

- Public transportation: planning, operations and management
  Gray-Hoel . 1979
THE EVOLUTION OF THE URBAN SPRAWL AND ITS REASONS

Oleg Grgurevic
International Fellow
Center for Metropolitan Planning and Research
The Johns Hopkins University
Baltimore, Maryland

June 1981
CONTENTS

1. City as Urban Center
2. Urbanization - The Beginning of the Process
3. "The Urban Phenomenon" - The Physical Result of the Process
4. The Factors of the Shift

Bibliography
This paper was written during my stay at The Johns Hopkins University - Center for Metropolitan Planning and Research in Baltimore where I spent one academic year as an international fellow.

The paper is in fact only a smaller part - precisely said, only the first chapter of the more detailed and broader written research that has been done in this period of time, thanks to the staff of the Metro Center and its very good library - and so should be seen.

As a whole, the study is about the appearance and spreading of a rural-urban fringe around the very end of our cities with the analysis of its structure and especially its newly formed visual qualities caused by the transformation of the morphology and physiognomy of the rural space as a result of the influence of the expanding "urban fields" that have brought the new way of life to the rural areas.

This paper is only about the evolution of the urban sprawl and its three main reasons.
1. THE CITY AS AN URBAN CENTER

Mumford says that "...mankind has formed cities of one kind or another for thousands of years. Civilization originated in the city and to a large degree remains centered there. The cities of the world have played an important role in shaping the course of human history and providing man with his higher standard of living and rising expectations." During history he says, they were "...one of two forms of human settlement that predominated in all but the most scarcely populated areas of the globe: the city and the rural village. The vast majority lived in the latter, and most of the world's work was done there. The villages were largely self-sufficient, not only in agricultural products, of course, but also in such manufactured products and services as they required."

Characterizing the essence of towns of that time and describing its relationship with surroundings Blumenfield says: "The latin word urbs is related to orbis, the circle. Like the English "town" and the Slavic "gorod" related to "yard" and "girdle", it denotes as the basic characteristic of the urban phenomenon the enclosure which separates it from the open country. This is the city as it has existed throughout recorded history: a static unit, confined and defined by its enclosing boundary, and with a definite pattern of its internal organization in which each part has a stable and defined relation to the whole.\(^1\) During the Middle Ages there was a rather clear physical

separation of city and country. The walls divided urban territory from rural territory and even the fabourgs, situated close to but outside the city gates, were apt to be brought within the then extended walls as soon as they had proven their viability.

"Economically, however, the city was closely integrated with its surrounding areas," and "this state of symbiosis and yet also of clear physical separation changed only gradually when the more wealthy went to live - for at least part of the year - outside the walls and when small industries, based upon water power or upon wood as sources of energy, sprang up in the countryside or in small rural towns."\(^1\)

"The landscape lay there beyond the fortification walls and moats, green and fresh with its vineyards, vegetable gardens, fields and wooden lands. Or, perhaps the landscape was untouched - rocky, wild, and romantic. Or whatever it was, indeed, features comparable to present-day random railroad-yards, disorderly factory-grounds, and dilapidated areas of one kind or another did not exist to make the town surrounding unpleasant. ...The medieval town was like an ornamental pattern of man's art fitted into the majestic environment of nature's beauty. So to speak it was like a precious stone of the medieval time, in the precious setting of all time."\(^2\)

This old pattern has begun to change radically only with what we "rather narrowly" called the Industrial Revolution, meaning the


application of scientific methods to the process of production and distribution. Thus, in history humans were surrounded by natural stimuli, but now such surroundings may require considerable effort to achieve. In evolution they were limited by technological capacity and so produced limited impact on the appearance of the environment. Today we have new situations in which people are often very far away from the city center, surrounded by "man-made" structures and "man-manipulated" landscape.
2. URBANIZATION - THE BEGINNING OF THE PROCESS

Cities before the Industrial Revolution contained only a small part of the total population.

Today we can see quite different relationships. Homer Hoyt in "World Urbanization - Expanding Population in a Shrinking World" says that: "In the 1960 world population of 2.96 billion, one billion persons were living in urban centers of 2,000 population or over, and 1.96 billion were living in villages or rural areas,"¹ it shows that the minority is in the rural areas. But furthermore, this relation of 33 percent to 66 percent is not the real picture of the situation because it is only averaged data. There are "tremendous variations in the degree of urbanization in different nations and continents. In older industrialized nations such as the United States, Great Britain and West Germany 75-90 percent of the total population live in cities, while we can see in underdeveloped countries the reverse relation, though we should say that "...the percentage of the population living in cities has increased in nearly every nation in the world in the past forty years" especially for the countries on the bottom of the urbanization ladder (See Table I and II).

The pace of the urbanization that has picked up sharply all over the world in the past decade or two as we can see in the less developed countries especially, has two reasons:

<table>
<thead>
<tr>
<th>Country</th>
<th>100,000 and over</th>
<th>20,000-99,999</th>
<th>1,000-5,000 to 19,999</th>
<th>Rural Areas</th>
<th>Total Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>61.8</td>
<td>9.8</td>
<td>14.1</td>
<td>14.3</td>
<td>85.7</td>
</tr>
<tr>
<td>ENGLAND AND WALES</td>
<td>60.2</td>
<td>10.6</td>
<td>10.1</td>
<td>19.2</td>
<td>80.0</td>
</tr>
<tr>
<td>SCOTLAND</td>
<td>55.8</td>
<td>15.3</td>
<td>11.9</td>
<td>17.0</td>
<td>83.0</td>
</tr>
<tr>
<td>WEST GERMANY</td>
<td>45.5</td>
<td>14.4</td>
<td>14.2</td>
<td>26.0</td>
<td>74.0</td>
</tr>
<tr>
<td>BELGIUM</td>
<td>42.5</td>
<td>20.1</td>
<td>7.4</td>
<td>30.0</td>
<td>70.0</td>
</tr>
<tr>
<td>THE NETHERLANDS</td>
<td>42.5</td>
<td>14.3</td>
<td>13.2</td>
<td>30.0</td>
<td>70.0</td>
</tr>
<tr>
<td>CANADA</td>
<td>46.6</td>
<td>9.4</td>
<td>21.0</td>
<td>31.7</td>
<td>75.0</td>
</tr>
<tr>
<td>JAPAN</td>
<td>47.3</td>
<td>29.5</td>
<td>3.3</td>
<td>20.0</td>
<td>80.0</td>
</tr>
<tr>
<td>EAST GERMANY</td>
<td>27.5</td>
<td>20.2</td>
<td>24.3</td>
<td>28.0</td>
<td>72.0</td>
</tr>
<tr>
<td>FRANCE</td>
<td>26.4</td>
<td>15.5</td>
<td>14.1</td>
<td>44.1</td>
<td>55.9</td>
</tr>
<tr>
<td>BRAZIL</td>
<td>20.7</td>
<td>5.5</td>
<td>11.6</td>
<td>62.3</td>
<td>37.7</td>
</tr>
<tr>
<td>EGYPT</td>
<td>23.7</td>
<td>11.8</td>
<td>7.9</td>
<td>69.0</td>
<td>31.0</td>
</tr>
<tr>
<td>INDONESIA</td>
<td>9.9</td>
<td>2.2</td>
<td>6.9</td>
<td>81.0</td>
<td>19.0</td>
</tr>
<tr>
<td>INDIA</td>
<td>9.7</td>
<td>4.7</td>
<td>2.8</td>
<td>82.7</td>
<td>17.3</td>
</tr>
<tr>
<td>THAILAND</td>
<td>10.6</td>
<td>0.4</td>
<td>0.8</td>
<td>88.2</td>
<td>11.8</td>
</tr>
<tr>
<td>PAKISTAN</td>
<td>5.6</td>
<td>2.5</td>
<td>2.9</td>
<td>89.0</td>
<td>11.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTINENT</th>
<th>TOTAL POPULATION</th>
<th>100,000 and over</th>
<th>20,000 to 99,999</th>
<th>2,000-5,000 to 19,999</th>
<th>RURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTH AMERICA</td>
<td>100.0</td>
<td>49.70</td>
<td>8.85</td>
<td>14.65</td>
<td>26.8</td>
</tr>
<tr>
<td>SOUTH AMERICA</td>
<td>100.0</td>
<td>27.32</td>
<td>8.19</td>
<td>11.00</td>
<td>53.5</td>
</tr>
<tr>
<td>EUROPE*</td>
<td>100.00</td>
<td>29.60</td>
<td>12.51</td>
<td>11.24</td>
<td>46.7</td>
</tr>
<tr>
<td>ASIA**</td>
<td>100.00</td>
<td>12.33</td>
<td>5.37</td>
<td>3.79</td>
<td>78.5</td>
</tr>
<tr>
<td>AFRICA</td>
<td>100.00</td>
<td>8.09</td>
<td>3.66</td>
<td>3.62</td>
<td>84.6</td>
</tr>
<tr>
<td>OCEANIA</td>
<td>100.00</td>
<td>43.33</td>
<td>3.69</td>
<td>14.44</td>
<td>38.5</td>
</tr>
<tr>
<td>WORLD TOTAL</td>
<td>100.00</td>
<td>19.92</td>
<td>7.20</td>
<td>6.75</td>
<td>66.1</td>
</tr>
</tbody>
</table>

* Including USSR
** Excluding USSR

Source: Hoyt, Homer, 1962, op. cit., Table III, pp. 27.
Firstly, the improvement in health conditions has lowered death rates while birth rates have remained unchanged,\(^1\) thus leading to a rapid increase in total population so-called "population explosion". The process is called "demographic transition" (See Figure 1).\(^2\) The pattern found in European societies shows an approximate balance between birth and death rates in the early pre-industrial phase. With urban and industrial development the death rate falls, followed - after a characteristic lag - by the birth rate. After a relatively short period of substantial population gains the two rates arrive once more at an approximate equilibrium. The developing nations of the world show a much more alarming pattern. While the death rate has plunged precipitously, the birth rate has remained steadily high.

Secondly, economic and social opportunities in the rural areas have been or have seemed, less attractive than in the cities, and rural people have flocked to the cities (See Table III). "Man, as species is congregating himself into urban complexes at a rate and on a scale that leaves the ultimate results much in doubt today."\(^3\)

Today in a very fast process of the urbanization that keeps all the world with higher or less intensity we can recognize ...two types of migrations. The first one is from the countryside into town, still very strong, and the second one, a new one, from the city, and somewhere even from the countryside directly, into suburban areas of the cities.

---

1 Mumford says that: "the contribution of soap to hygiene, when it turned from a courtly luxury to a household necessity, has done more to lower the death rate than any other single factor."


Figure 1  Birth and Death Rates in European Societies (left). Birth and Death Rates in Developing Nations (right).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>88,030,076</td>
<td>111,303,468</td>
<td>26.40</td>
<td></td>
<td>1.85</td>
</tr>
<tr>
<td>UNITED KINGDOM (1948)</td>
<td>25,078,221</td>
<td>25,362,278</td>
<td>1.13</td>
<td></td>
<td>0.42</td>
</tr>
<tr>
<td>WEST GERMANY</td>
<td>12,933,924</td>
<td>16,180,613</td>
<td>25.10</td>
<td></td>
<td>1.19</td>
</tr>
<tr>
<td>CANADA</td>
<td>3,260,939</td>
<td>3,661,994</td>
<td>12.30</td>
<td></td>
<td>2.82</td>
</tr>
<tr>
<td>JAPAN</td>
<td>21,326,215</td>
<td>38,259,000</td>
<td>79.40</td>
<td></td>
<td>1.17</td>
</tr>
<tr>
<td>EAST GERMANY</td>
<td>2,513,424</td>
<td>2,598,778</td>
<td>3.40</td>
<td></td>
<td>-0.76</td>
</tr>
<tr>
<td>BELGIUM (1946)</td>
<td>563,186</td>
<td>890,247</td>
<td>58.07</td>
<td></td>
<td>0.83</td>
</tr>
<tr>
<td>NETHERLANDS (1947)</td>
<td>3,145,183</td>
<td>3,759,242</td>
<td>11.95</td>
<td></td>
<td>1.49</td>
</tr>
<tr>
<td>FRANCE (1946)</td>
<td>6,592,957</td>
<td>7,205,186</td>
<td>9.29</td>
<td></td>
<td>0.70</td>
</tr>
<tr>
<td>BRAZIL</td>
<td>6,873,235</td>
<td>11,311,795</td>
<td>64.58</td>
<td></td>
<td>2.63</td>
</tr>
<tr>
<td>EGYPT</td>
<td>3,652,274</td>
<td>5,493,900</td>
<td>50.42</td>
<td></td>
<td>2.79</td>
</tr>
<tr>
<td>INDONESIA</td>
<td>5,736,000</td>
<td>8,469,200</td>
<td>47.65</td>
<td></td>
<td>2.19</td>
</tr>
<tr>
<td>PAKISTAN</td>
<td>3,852,704</td>
<td>6,885,000</td>
<td>78.70</td>
<td></td>
<td>2.37</td>
</tr>
<tr>
<td>INDIA</td>
<td>23,551,617</td>
<td>35,036,000</td>
<td>48.80</td>
<td></td>
<td>1.59</td>
</tr>
</tbody>
</table>

Source: Hoyt, Homer, 1962, op. cit., Table XIII, p. 45.
Hans Blumenfield in describing the U.S. urban model says:¹ "While the original urban wave of the country to city migration continues in full force it is now met by a new outbound city to suburb wave. This wave of expansion, which started about a century ago is still gathering momentum. The result of the interaction of these two waves is a completely new form of human settlement which can no longer be understood in the traditional terms of town-and-country or city-and-suburb."


In the past one century and a half the world has reached the range of the urbanization that significantly changes the appearance of the cities and of the landscape in their surroundings. The transformation of the space is so strong and so widespread especially in the United States, that Beaujeau J.-Garnier and G. Chabot call "The urban phenomenon," "...without doubt, one of the most striking features of contemporary civilization."\(^1\) The use of the expression "phenomenon", signifying an astonishing appearance, demonstrates something paradoxical in the development of cities. We don't, after all, speak of a rural phenomenon, "as it seems to us perfectly natural."\(^2\)

This is a space expression of a recent tendency towards the phenomenon we call "suburbanization." "Between 1940 and 1950 it could be estimated roughly that the population in the urban fringes had increased two and a half times more rapidly than in the central areas,"\(^3\) and "five and a half more rapidly between 1950 and 1960."\(^4\)

Today we don't need too much to prove the very obvious fact, that suburban areas are in the first place a main expression of today's metropolitan regions (Weber, E.M., 1899). The suburban phenomenon,

---

that began as a socially exclusive one and then extended to the upper
and middle-income families that could afford the cost of moving away
from the crowded areas of the city center, has taken widespread shift.
In the period between 1940 and 1950, suburban growth that took place
around big cities was 2.5 times bigger than that of the corresponding
central cities.\footnote{Bogue, Donald J., URBANISM IN THE UNITED STATES 1950, The American
Journal of Sociology, LX, March 1955, p. 481.} Even more, in the period between 1950 and 1960 the
growth was 5.5 times higher.\footnote{Beaujeau, J.-Garnier and G. Chabot, 1971, op. cit., p. 9.}
Or, for example, New York where the
total population of the "core" (New York City's four major boroughs
and Hudson county) in 1985 has been estimated by Vernon Raymond to be
7,810,000, a decline of almost a half-million from the 1955 population.
But the population of the outer ring (from 90 minutes from Manhattan
up to 30 miles beyond that) has been estimated to be some 7,809,000,
an increase of over 300%.\footnote{Raymond, Vernon, METROPOLIS: 1985, Cambridge, Massachusetts,
Harvard University Press, 1960, p. 221.}

The suburbs of the concentrated European cities or the United
States of the nineteenth and early twentieth century are quite different
from the over-spill of the American urban areas occurring in the last
three decades. "Suburbanization," "North American pattern" or
"suburban sprawl," still is far more common in the United States than in
Europe. Such sprawl consists of a real ring of settlements around the
city and it enjoys a lower density of population than the city it
surrounds, and its population density tends to decrease the further one
moves from the city core. Taking into account its range and today's form, Mumford describes them as "...the production of a new kind of urban tissue in the open pattern of the suburbs."¹ But others don't think in the same way. Friedman and Miller say that: "Derogatory slogans, such as sprawl and scatteration, bandied about in ideological campaigns will have to be discarded in any search from what it means to live on the new scale."² But, anyway, we think that Gutkind was right when he said that such development means that "the unity between the individual scale and the totality of the environment has been broken down."³

William White, writing about suburbs, says: "With the great postwar expansion of suburbia in the forties and fifties, we carried this to the point of caricature. We were using five acres to do the work of one, and the result was not only bad economics but bad aesthetics. People began to feel that if things looked this awful, something had gone wrong."⁴ Decrease of urban density reflects a widespread ability to afford greater amenities of space and nature. But some of the decrease simply reflects waste of land, and waste of public outlays to service a pattern of random development scattered around cities. G.A. Wissink suggests that only a portion of suburban development is the result of

an effective, stabilized pursuit of better living conditions. Other suburban development lacks the planning which will maintain a stable environment.

Cities have become metropolitan areas. The rural space on their outskirts and between them unaffected by urbanization will continue to disappear. In the vast urban regions now formed and expanding, all land will respond to forces emanating from the city. "America has now entered the era when metropolitan regions are losing their traditional ability to expand outward: their boundaries are beginning to touch and merge."\(^1\)

Various concepts have been put forward in the endeavor to capture the expanding scale of urban life. The simultaneous growth of several of such metropolitan cities within a small radius often caused them to merge into the polynuclear metropolis or what Patrick Geddes has termed "conurbation"\(^2\), the growing together of several important independent cities. This has already occurred in places such as the English midlands, the Rhine-Ruhr area of Germany and in the northern region of the United States from Washington to Boston called "Megalopolis"\(^3\).

"Beyond the edge of the city where today's suburbs trail off into fitful countryside, there is another city larger than any that has been built before. You cannot see it even if you drive off into the cornfields. But it is there, breathing in the silence all around you. It is there in the forces that are already loosed, in the rules you have established, in the adjustments you will make."\(^4\)

\(^1\) THE NEW CITY, edited by Donald Canty, Frederick A. Praeger Publishers, New York City, 1969, p. 36.
\(^2\) Geddes, Patrick, CITIES IN EVOLUTION, Oxford University Press, 1950.
4. THE FACTORS OF THE SHIFT

Although technology had revolutionized long-distance transportation that made it possible to assemble at one point the food and raw materials required to support the life and work of millions of people, "...well before the middle of the nineteenth century"¹, goods, persons, and messages within these huge agglomerations still moved almost exclusively by foot or by hoof. The horse-drawn omnibus "...was the earliest form of public internal transportation in American cities,"² and "...by the end of the 1960's the horse railway was the principal form of internal transportation in most cities"³. This, of course, limited their size of about "...one hour's walking time or four miles. Within this narrow perimeter houses, factories, docks, and railroad yards crowded together,"⁴ making still sharp distinction between the city and its surroundings.

Street railways that followed the horse-drawn omnibus were the first step in encouraging suburban development. "The electric street railway, in the half century of its predominance, produced lines and nodes of high-density residential and commercial development; it also facilitated the spread of urbanization into the surrounding countryside. "...but the electric street railway was essentially a local facility to serve the city themselves."⁵ Almost half a century after the technology had

³ Blumenfield, Hans, 1964, op. cit.
⁵ Murphy, E. Raymond, 1974, op. cit., p. 233.
revolutionized long-distance transportation, new technologies revolutionized transportation and communication between the city and its suburban areas. It was "the steam railroads that generally were the passenger carriers for the outer suburbs, where much of the urban expansion was taking place." 1 It was a relief, but ". . . most industry however, was still concentrated in the large cities, where the economies of steam power could be best realized." 2 They were ". . . still growing more rapidly than the smaller places, chiefly through migration . . . and most urban places beyond 10 or 15 miles remained largely independent of their center." 3

Within that zone, however, interurban railways were gradually able to provide more regular service, and more and more people working in the city found it possible to live outside its formal boundaries. These early suburbanites lived in new residential developments within walking distance of the railway commuter stations.

And while electric street cars and later the motor bus enabled urban residents to live further and further away from the urban center, it did not allow them to break their ties with the core. The street car tracks radiated out from the CBD "like spokes on a wheel." (Figure 4) Lateral or cross-town services were usually very poor. "If you wanted to go somewhere, you went by mass transit, . . . and if you went by mass transit, you went downtown." 4

1 Murphy, E. Raymond, 1974, op. cit., p. 234.
FIGURE 2. Chicago Area Growth Pattern.


<table>
<thead>
<tr>
<th>Year</th>
<th>Railroad Trackage (miles)</th>
<th>Surfaced Highways (miles)</th>
<th>Railroad Locomotives (No.)</th>
<th>Motor Vehicles (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>193,348</td>
<td>128,500</td>
<td>37,663</td>
<td>8,000</td>
</tr>
<tr>
<td>1910</td>
<td>240,293</td>
<td>204,000</td>
<td>60,019</td>
<td>468,500</td>
</tr>
<tr>
<td>1920</td>
<td>252,845</td>
<td>369,000</td>
<td>68,942</td>
<td>9,239,161</td>
</tr>
<tr>
<td>1930</td>
<td>249,052</td>
<td>694,000</td>
<td>60,189</td>
<td>26,531,999</td>
</tr>
<tr>
<td>1940</td>
<td>223,670</td>
<td>1,367,000</td>
<td>44,333</td>
<td>32,045,424</td>
</tr>
<tr>
<td>1950</td>
<td>223,779</td>
<td>1,714,000</td>
<td>42,951</td>
<td>48,566,984</td>
</tr>
</tbody>
</table>

FIGURE 5. Estimated Passenger Miles of Travel in the United States, 1900 to 1974.

In 1902 Wells wrote "So far the only additions to the foot or horse ...are the suburban railways...The star-shaped contour of the modern Great City, thrusting out...knotted arms of which every knot marks a station, (See Figure 2) testify...to the relief of pressure thus afforded. Great Towns before this century presented rounded contours and grew as puff-ball swells; the modern Great City looks like something has burst an intolerable envelope and splashed...the mere first rough expedient of far more convenient and rapid developments (pp. 50-51)" and "We are... in the early phase of a great development of centrifugal possibilities...A city of pedestrians is inexorably limited by a radius of about four miles...a horse-using city may grow out to seven or eight...Is it too much...to expect that the available area for even the common daily toilers of the great city of the year 2000 will have a radius of over one hundred miles?" (pp. 51-52)\(^1\)

The first of decentralization we can see in the 20's was when they began the significant aspect of the growth of many smaller cities. Both industry and population were scattering as a response to the development of the motor vehicle. Immediately after the first world war we can see the rise of the motor vehicle (Table IV and Figure 5) and hard-surfaced roads began to crisscross the areas surrounding the largest cities. Many of the techniques of modern mass production - later adopted in almost sector of the economy - were first developed in the automobile industry.

"Spatial changes followed these trends and some of the larger subcenters

underwent a significant transition. They lost their high degree of independence and fell under the dominating influence of the metropolis.¹

But the whole pre-Second World War development was, in spite of all, very limited in its range. However, we were able to see all characteristics of the future process, that occurred with mass-migration toward suburban areas during the 50's, and especially the 60's. "When private individual transportation has become the most powerful instrument for changing the urban and rural landscape and for changing the way of life of city and countryside residents."²

Unlike the fixed street tracks of the public transportation system that had dominated until recently, that almost always, as we saw, led downtown and thus encouraged transit patrons to maintain their social and economic ties to the core, the private car could go instantly almost anywhere where there was a road.

The space has become "unlimited", and easy of access. Not only for citizens, but even for the residents of rural areas (Figure 3).

There are three main factors that have simultaneously enabled process of the city disintegration and the forming of suburban areas to such an extent, that Mumford called them a "new kind of urban tissue."

In 1899 Weber had noticed "the rise of suburbs" of which he expected much as a remedy for the evils of city life. Concentration of population in his opinion seemed destined to continue, but as a modified concentration. In that concentration he thought four goals to be of fundamental importance: 1. a shorter working day, which (would) permit

¹ Schnore, Leo, METROPOLITAN GROWTH AND DECENTRALIZATION, op. cit.
² Jackson, Kenneth T., THE EFFECTS OF SUBURBANIZATION ON THE CITIES, op. cit.
the working man to live at a distance from the factory, 2. associations for promoting the ownership of suburban homes by working men, 3. cheap transit, and 4. rapid transit. ¹

Time has proven the lucidity of Weber's views. Relative concentration of population has indeed continued and has even further gained in strength. "Moreover the urban way of life and many of its material tokens have increasingly penetrated the countryside."²

Andrews, 1942, mentioned three reasons for suburban growth, too: "Working with what have been termed "basic forces" in creation of the urban-fringe are at least three forces which may be called "catalytic forces". Perhaps the leading catalyst is the auto and, paved highway which has given a flexible form of escape to the city-bound resident and per contra, ready accessibility to the city for the fringe resident. Under the influence of this means of transportation the location of the "fringe home" is not tied to transit line routes and schedules but enjoys the independence of the broadcast highway network. A second catalyst which operates most effectively among the high and middle income classes is that of the "fashion trend" which tends to stimulate movement out of the city and the development of the "planned community type" subdivision. Closely allied to and working in conjunction with the "fashion factor" is that of the "speculation factor" which is evidenced in the pressure selling of land and homes to city and rural residences. Speculative sales

¹ Weber, Adna Ferrin, THE GROWTH OF CITIES IN THE NINETEENTH CENTURY, A STUDY IN STATISTICS.
methods usually capitalize on the existence of high land values, rents, taxes, and incipient fashion trends within the city to push a rapid turnover of lots and homes. Uncurbed by local regulation large real estate promotions can become highly potent stimulants to fringe growth."

Twenty years later Friedman and Miller wrote "The main reason is the increasing attractiveness of the periphery to metropolitan populations. It has space, it has scenery, and it contains communities that remain from earlier periods of settlement and preserve a measure of historical integrity and interest. Demand for these resources will be generated by three main trends: increasing real income, increasing leisure, and increasing mobility." Mumford describes the same in his way: First the change in the mode of human settlement brought about by fast transportation and instantaneous means of communications. As a result, physical congestion is no longer the sole possible way of bringing a large population into intimate contact and cooperation. From this has come another change: a change, wherever sufficient land is available at reasonable prices, in the whole layout of the city: for in the suburbs that have been growing so rapidly around the great centers the buildings exist, ideally, as free-standing structures in a parklike landscape. Too often the trees and gardens vanish under further pressure of population, yet the sprawling, open, individualistic structure, almost anti-social in its dispersal and its random pattern, remains. The third great change is the

general reduction of working hours, along with an increasing shift of work itself from industrial occupations to services and professional vocations.\textsuperscript{1}

Finally, we can assume from what has been said that in the first place we have to put the implementation of new technologies, particularly in the field of mass and individual transportation that made our world small. The second reason is the possibility for nearly everybody to use a private car in everyday commuting. It is the result of a higher and higher standard of living (Table V). And a higher standard of living means such things as a house in the suburbs, car, eight-hour day, five-day week, holidays with pay, substantial retirement pension and more education. People have wished to live in new homes out of the cities in clean air with plenty of space around them. And as the third reason we can mention a cultural and social impulse that has pushed people to low populated suburban regions. Collin Clark says "There are two possibilities for development if the population is increasing. Either transport costs are reduced, enabling the city to spread out, or they cannot be reduced, in which case the density has to increase at all points."\textsuperscript{2}

All these have been producing widespread effects in man's relations to the land, countryside and its landscape.

\textsuperscript{1} Mumford, Lewish, 1968, op. cit., pp. 80-81.
<table>
<thead>
<tr>
<th>NATION</th>
<th>POPULATION 1960 (MILLIONS)</th>
<th>CONSUMPTION OF ENERGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TOTAL</td>
<td>URBAN</td>
</tr>
<tr>
<td>UNITED STATES</td>
<td>179.3</td>
<td>153.7</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>47.4</td>
<td>37.9</td>
</tr>
<tr>
<td>WEST GERMANY</td>
<td>55.3</td>
<td>40.9</td>
</tr>
<tr>
<td>BELGIUM</td>
<td>9.1</td>
<td>6.4</td>
</tr>
<tr>
<td>NETHERLANDS</td>
<td>11.4</td>
<td>8.0</td>
</tr>
<tr>
<td>CANADA</td>
<td>17.9</td>
<td>10.7</td>
</tr>
<tr>
<td>BRAZIL</td>
<td>66.3</td>
<td>16.5</td>
</tr>
<tr>
<td>EGYPT</td>
<td>25.4</td>
<td>5.5</td>
</tr>
<tr>
<td>INDONESIA</td>
<td>89.9</td>
<td>16.2</td>
</tr>
<tr>
<td>INDIA</td>
<td>407.9</td>
<td>70.9</td>
</tr>
<tr>
<td>THAILAND</td>
<td>22.7</td>
<td>3.5</td>
</tr>
<tr>
<td>PAKISTAN</td>
<td>86.8</td>
<td>9.6</td>
</tr>
</tbody>
</table>

Source: Hoyt, Homer, op. cit., Table VII, p. 38.

FIGURE 7. Shift of locations of fashionable residential areas in six American cities, 1900 to 1936. Fashionable residential areas are indicated by solid black.

Source: Murphy, Raymond E., 1974, op. cit., p. 300.
Bibliography


Geddes, Patrick, CITIES IN EVOLUTION, Oxford University Press, 1950.


Physical Planning in Prague and Baltimore:
A Comparative Study

Pavel Svab
Junior Fellow
Johns Hopkins Center for Metropolitan Planning and Research
Baltimore, Maryland
May 1981
Contents

1. Introduction
2. City of Prague - a description in brief
   2.1 Some figures on Prague
   2.2 A general analysis of Prague City
   2.3 The historic development of Prague
3. The physical planning for Prague City
   3.1 The organization of the physical planning process
   3.2 A brief description of Master Plans for Prague
   3.3 An elaboration of the latest Master Plan for Prague City
       and the City Development Model
4. Principal objectives for the physical development of Prague City
5. A comparison of physical planning for Baltimore City and Prague City
6. Notes
1. Introduction

Physical Planning is the final phase of a complex process. Physical planning involves a more precise definition of planning objectives and policies than what has been stated in current planning documents. Physical planning also exercises the projection of development principles to specific physical entities. In comprehensive and interconnected planning systems, such as the one utilized in Czechoslovakia, physical planning naturally affects or amends the elaboration of development objectives and policies in basic planning documents.

Comprehensive physical planning makes possible the achievement of optional objectives deliberately derived from a wide spectrum of partial and sometimes differing viewpoints. The methodology and content of this complex approach is still being developed in the theoretical as well as practical sense.

While comprehensive physical planning in Czechoslovakia has a past of 60 years, the utilization of a truly scientific approach was initiated during the period following the Second World War. The contemporary level of comprehensive city and regional planning in Czechoslovakia is considered to be one of the advanced articulations of urban problems in Europe. For this reason, I devote the first part of this study to a short analysis of physical planning for Prague, the Capital of Czechoslovakia. I feel that this could be stimulating for all individuals involved in further research within this branch of planning.

The second part of this study is devoted to a comparison in brief of physical planning for Baltimore and Prague. In spite of considerable differences in various factors determining the planning process within these two cities, I assume that this section could serve the needs of those wishing to obtain greater familiarity with some of the approaches and processes indigenous to physical planning in both countries.

I thank Mr. R. Perciasepe of the Baltimore City Department of Planning and Mr. P. Dombrowski of the Department of Housing and Community Development for providing an introduction as well as valuable information concerning physical planning for Baltimore City.

I would also like to express my sincere gratitude to Mr. D. Bilgin for his help in drafting this article.
2. The City of Prague - a description in brief

2.1 Some figures on Prague

Prague is the capital city of Czechoslovakia - the actual administrative, economic, social and cultural center of Czechoslovak Socialist Republic. Prague City occupies an area reaching nearly 500 km² (193 sq. miles) and has 1,192,000 inhabitants according to the 1975 census. The Prague city area covers about 0.4% of the total area of Czechoslovakia (49,400 sq. miles) and contains about 8% of the total population of the CSSR (14.9 million inhabitants according to the 1975 census).

Administratively the Prague city represents a territorial unit having the status of a region. The contemporary territory of Prague city makes possible prospective city development for at least 15 years.

Prague's metropolitan agglomeration is the actual urban unit used for urban planning purposes and involves a territory of about 3350 km² (1299 sq. miles) having approximately 1,612,000 inhabitants. Prague's metropolitan agglomeration consists of Prague city and the surrounding hinterland containing a cluster of satellite cities, towns and villages within the administrative authority of the Central Bohemian Region. The Central Bohemian Region includes 4,077 sq. miles (excluding the City of Prague) and has a population of 1.32 million. An effort to achieve congruence between the physical territory of Prague's agglomeration and its administrative status has not yet been successfully concluded.

2.2 A Brief general description of the Prague City.

The contemporary economic characteristics of Prague show outstanding economic potential in the second, third as well as the fourth economic sectors with a marked dominance of a tertiary sector.

The second economic sector represents about 10% of the total industrial potential of the republic and encompasses machinery industry, the electrical equipment industry, the production of transportation equipment, the instrument and related products industry, miscellaneous industries, the food and kindred products, as well as the production of printing and publishing facilities and materials. The machinery industry produces power plant equipment, large Diesel engines, various types of tools machines and dredging boats. Electrical equipment
production consists of equipment for power plants, electromotors, telephone switching systems and devices, small computer units and lighting devices. The production of transportation equipment is represented by street cars, electrical locomotives, and medium size trucks while the instrument industry produces various medical instruments, measuring devices and automated operational units.

The 3rd economic sector consists of important facilities and enterprises of various qualitative levels in all fields of this widely spread sector. These facilities respond to demands not only in the city, the agglomeration and in part the Central Bohemian Region but in some spheres such as business and commerce, medical care and recreational activities serve much larger territories. Cultural facilities represent an exceptional concentration of theatres (21), concert halls, museums, art galleries, exhibition halls and civic centers. With regard to historic background and the above mentioned cultural potential, Prague is the center of domestic as well as foreign tourism. The figures from the year 1975 show that about 5.4 million foreigners visited Prague.

Prague is also an important national and international transportation junction, having national and international airports, a dense network of railroad, several bus terminals and a less important freight terminal on the river. The highway system is not yet sufficiently developed and represents linkages with principal Czechoslovak cities.

The 4th economic sector is presented by university level schools, research institutes and facilities. The educational field comprise 11 universities. Two of these, the Charles University established in 1348 and the Czech Institute of Technology established in 1786 evolved among the first schools of such type in Europe and presently they include several schools. Other universities have specialized education programs. The total number of university students is approximately 58,000 and there are some 12,800 university employees. While basic research freedom contributes to such activities, some applied research is also focused on the social, economic and natural sciences. There are about 13,300 employees.

A substantial proportion of employment within Prague city is taken up by administrative functions at all levels. These include the federal government, the state government as well as city governments and the numerous headquarters of production and service organizations. The social structure of Prague shows in accordance with the above mentioned economic characteristics an outstanding high percentage of individuals with high school and university educations.
Average individual monthly income for Prague City is assessed at 2,700 Kes and represents a slightly higher figure than the Czechoslovak per capita income. Prague reflects an unfavorable age structure of inhabitants with a higher proportion of elderly inhabitants in comparison to the other larger cities. The environmental components of the city will be described along with the land use structure, spatial composition and prevailing environmental quality conditions.

The land use structure can be adequately described through the principle of city center organization, employment facilities, the characteristics of residential and recreational areas.

The central system of Prague can be characterized as a developing polycentric system. The principal city center which corresponds to the Prague historic urban reservation (PHUR), accounts for a substantial amount of the central facilities. The PHUR, with an area of 866 ha. (3,34 sq. miles), involves 205,000 job opportunities predominately in the 3rd and 4th economic sectors. This represents some 30% of all job opportunities in Prague city. The concentration of facilities for business, commerce, medical care, high education and governmental administration at all levels often amounts to more than 50% of the capacity for the entire city. A majority of these facilities are rated at higher and special facility grades.

Five district centers and about 15 of largest community centers complete the basic polycentric city system. The capacity of central facilities in these centers vary from 1% to 4% of the total capacity of central facilities in the city. The remainder of the total capacity is taken up by lower level centers such as less important community centers and all neighborhood centers as well as several specialized university, scientific and health centers.

In spite of a relatively high concentration of facilities in the third and fourth economic sectors, the average figures for floor space per inhabitant in Prague remain below existing state standards.

The employment facilities of the 2nd economic sector are spread densely in facilities of various sizes within the entire city area with the exception of several well developed industrial parks. These very disadvantageous allocations from the economic as well as environmental viewpoint have brought about the construction of additional industrial parks. These production centers located in outer city ring have begun to successfully develop in accordance with contemporary investment policy.
Housing is spread over the entire city territory. Residential structures are united with various employment and recreational facilities in central areas while in other parts of the city housing constituted homogenous residential areas. Residential buildings in the PHUR date back to the 13th century. The dimensions of these buildings represent a wide range of types beginning with 2 or 3 story single family houses, formerly used by medieval merchants, and ending with 7 story residential structures built in the period between the wars. The majority of residential houses form irregularly shaped blocks. Residential areas in the inner city predominantly form regular block systems with an average building height of about 6 stories. Residential areas within the inner city are sufficiently equipped with the approximate basic as well as higher level community and social services such as facilities for business, education, health and culture. Nevertheless, open recreational facilities of adequate quality remain in short supply.

Housing in the outer city was predominantly built after the Second World War in various urban configurations. These residential areas are mainly composed of dwelling houses that are from 3 to 18 stories high. Housing projects implemented after the year 1950 have been predominantly built through the use of systems of prefabricated construction. Community and social services within new housing estates are gradually built to comply with existing qualitative and quantitative standards. In the outer city area and partly within the inner city ring several lesser residential areas composed of single, duplex, as well as family row houses were constructed.

Average inhabitant densities of residential areas vary from 190 inhabitants per acre in the inner city circle with a density of 100 inhabitants per acre in the city suburbs.

Also residential areas of outer city territories show a higher percentage of larger flats than residential areas of the inner city as depicted in the following figure:

<table>
<thead>
<tr>
<th></th>
<th>Flats having 4 rooms</th>
<th>Flats having 5 or more rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner city</td>
<td>15.4%</td>
<td>7.7% of the total number of dwelling units</td>
</tr>
<tr>
<td>Outer city</td>
<td>30.6%</td>
<td>13.1%</td>
</tr>
</tbody>
</table>

A majority of recreational facilities of higher and special standard levels in the sphere of cultural and sport activities is located in the downtown area and on territory adjacent to the inner city circle.
A considerable number of cultural facilities advantageously utilize historic buildings and complexes that have been converted for such purposes. Regular cultural and sport facilities that are the basic components of standard community services are spread within the whole city. However, the capacity of these facilities do not attain specified quantitative standards. (For instance the capacity of existing sports facilities is at 4.5 m² per inhabitant and doesn't correspond to the specified 20.0 m² per inhabitant).

The extensive touristic activities of Prague are made possible by its historic development as well as the organization of its' various cultural events. The historic development of Prague is represented by preserved physical structures such as the PHUR and other historic complexes beyond the numerous museums and galleries. Among other cultural activities that are organized in Prague, the international art exhibitions, television festivals, international music contests and professional conferences as well as congresses can be mentioned.

In the inner city area several dozens of former historical gardens and parks of various sizes have been preserved as well as the system of radial open area wedges penetrating urbanized areas of the outer city. These open spaces usually have outstanding landscape qualities and serve for short term Prague's hinterland within a radius of about 60 miles provides a relatively high quality environment for intermediate term recreational activities. This area is widely used by Prague's inhabitants. According to the results of a recently implemented survey concerning the weekend activities of the citizens, it was found, that about 44% of the inhabitants of selected residential areas leave Prague. The destinations of these trips are recreational facilities owned by the travellers or the homes of their relatives in the country.

As the majority of large European cities, Prague shows an unbalanced relation between the number of inhabitants and the number of job opportunities within individual city units. This unfavorable situation has been caused by natural centripetal forces affecting the location of employment facilities in one or several concentrated centers as well as ineffective policy incentives for dislocations. Despite the successful development in recent years of a new policy for facility allocation, nearly 50% of job opportunities remain in the CBD and in a narrow circle adjacent to the inner city. This is an area equivalent to approximately 2000 ha or 110 sq. miles. This fact, in combination with dense urban structures within a territory of the inner city has strongly affected the existing concept underlying the transportation system. In spite of the fact that both mass transit and individual transportation have been gradually developed, the emphasis has been upon mass transit. Mass transit represents a combination of railroad, subway, streetcar and bus lines. Transportation within the agglomeration is provided by rapid transit (regional train) and in part by the bus network; whole subways, streetcar lines and buses serve the city.
The construction of the subway system was begun in 1968. It currently consists of two lines in operation with a combined length of 20km (12.5 miles). A third line measuring 6 km is nearing completion.

In 1978 about 78% of all job related trips were conducted by mass transit. Road network shows the classical radial and circular road pattern created by arterial, and local streets. The city expressway system is under construction except for several segments and intersections which are currently in use.

In spite of the construction of several multi-level parking facilities in the past and continued construction, a majority of the automobiles are parked on streets and other surface parking lots.

Individual transportation is subject to regulation within the PHUR. Only selected streets of the PHUR road network are used for regular transportation, while other streets exclusively serve service transportation and pedestrian transportation, as well as some mass transit. In city centers the existing network of pedestrian streets is enhanced.

Utility services can be briefly described in the following selected figures. Apartments are heated by various single room or multi-room heating units. Block or territorial heating facilities as well as centralized heat with individual buildings are also available. About 75% of the buildings are equipped with central heating systems. The heat is produced by the combustion of solid fuels (84%) consisting of different types of coal or processed coal products. The remaining need for heating energy is met through the burning of liquid fuels (heating oils - 5%) and natural and industrial gases (10%). Electric power for heating is used only exceptionally.

The supply and production of gas and electricity respond to current standards and demands. Electricity is predominantly produced by the combustion of solid fuels as well as oils.

The water supply covers necessary city needs. Water is obtained by the treatment of Vltava river water and from several natural and artificial water reservoirs outside of Prague city.

The liquid waste collection system is permanently expended as a result of capacity depletion of the contemporary city sewer system. The capacity of treatment facilities for liquid wastes have also been depleted. Solid waste disposal is performed by ordinary means of collection. The liquidation of solid wastes is carried out by disposal into landfills and through various processing methods.
Processing facilities utilized in Prague consist of several incinerations and the stations utilizing recycling process.

The spatial composition of the settlement is formed by the interaction of natural and man-made components. From a standpoint of natural elements, Prague's spatial composition is based on the Prague valley containing the Vltava river and supplemented by several transversal valleys. Therefore, the terrain of the city is very varied with extreme height differences of about 150 m (490 feet). Prague is situated at 280 metres above sea level. At many places, original open spaces encompassing forests, gardens and parks were protected to the present and significantly contribute to the exceptional appearance of the entire city.

The allocation of urbanized areas within the territory of existing natural zones has been very carefully managed during past as well as contemporary city development. Only a few examples can be cited to the contrary. The urbanized areas of Prague can be divided into three characteristic territories. The first, involving the area of the PHUR, represents the haphazardly and partially planned physical block structure of a well developed medieval town. This area contains buildings built up in various architectural styles since the 12th century with an average height of about 4 stories. An outstanding panorama is created by the steeples of numerous churches and cathedrals, the natural attributes of the Vltava Valley, and the imposing presence of Prague's castle.

The second territory, a wider inner city ring surrounding the principal city center, involves urbanized areas mainly built up between the middle of the 19th century and the end of the Second World War. This territory is predominantly formed of regular quid construction systems with average 6 story blocks which are varied by several dozens of low density residential areas. A majority of the buildings are built of bricks and have a plaster surface.

The outer city territory depicts post war city development. Having projects formed in various compositions of detached structural patterns represent a majority of urbanized areas. The buildings were predominantly constructed from panel components with painted concrete surfaces. Structural height varies from 3 to 20 stories while a majority of buildings have heights of between 7 and 9 floors. The urban design of these residential areas as well as employment facilities has respected the valuable natural attributes particular to this territory.
The wide spectrum of environmental conditions will be narrowed to selected items for the purposes of this general description. Air quality logs behind the level of optimal air standards in several regions of Prague City. This is a result of a high proportion of solid fuels and lesser quality oils used for heat and electricity production as well as an unfavorable terrain configuration and adverse climate (wind) conditions. The environmental quality of Prague's streams such as Vltava river and it's tributaries is also unsatisfactory. This is a natural consequence of inadequate waste water treatment in industrial facilities and settlements located up stream on the Vltava river. The level of solid particles in the air also exceed allowable standards in several areas of the city.

The physical protection of Vltava river banks and tributaries against flood hazards is sufficient in all areas with the exception of several short and unimportant segments.

Noise pollution exceed in many cases noise levels determined by the state. Existing noise standards are relatively representing for purely residential areas maximum noise pollution level of 55dB and for mixed residential areas a level of 65 dB.

Physical conditions in built up areas show various construction characteristics. While the historic city center and the adjacent ring of the inner city deserve higher attention current maintenance, reconstruction or renewal efforts, the quality of remaining structures in the city is relatively acceptable. The contemporary physical state of the PHUR has been brought about the enormous capital investment for complex revitalization on the one hand and the necessity for the construction of new residential suburbs following the Second World War on the other hand.

Exceptional qualities in man-made structures as well as natural elements are subject to state protection. Several hundreds of historic monuments and complexes as well as several natural (wild life) reservation within Prague's territory are protected by the state. In the year 1972, the old city of Prague has been decreed a historic urban reservation. The area of the PHUR which is one of the largest and most important urban reservations in Europe contains a preserved individual layout scheme with 1322 historic buildings and complexes conserved for various social reasons. The PHUR represents more than 1000 years in the physical development of the city and is a subequal component of the comprehensive development of European civilization.
2.3 The Historic Development of Prague City in Brief

According to historic written sources Prague was established in the 9th century as a fortified settlement by Slavic princes. It consisted of a wooden temple, farm houses and the homes of merchants. At the beginning of the 10th century, Prague became a seat of Czech kings and first sacral constructions in stone emerged. In the middle of the 11th century the Old Town of Prague was built in early medieval romanesque style and gradually developed for the following two centuries. This town was formed of wooden and houses. In 1234 the substantially redeveloped Old Town of Prague was surrounded by a bulwark. In 1257 and 1320 two new historic Prague townships were established - The Lesser Prague Town and the Hradec Town that were attached to the south and southwestern walls of Prague's castle. In the 14th century and during the reign of Charles the 4th, King of Bohemia and Germany, Prague undertook some ambitiously planned physical development. The New Town of Prague became an extraordinary example of gothic city planning in Europe. The fortified City of Prague consisted of 2 castles and 4 towns and had according to written record approximately 50,000 inhabitants living in an area of 1940 acres. Prague shared with Venice and Paris the unofficial designation of the largest city as well as political and cultural center of medieval Europe.

The period between the 15th and 18th centuries was an era of stagnation from a viewpoint of the territorial development of the city. Prague is constructed within the boundaries of the former gothic city.

The baroque era of the 17th century was an important period for Prague's redevelopment and outstandingly enriched the image of the city.

The foundation of Karlin as a suburb in the classicist style marked the beginning of new suburban development spurred by rapidly advancing industrialization and growing urbanization.

Within the period 1880-1901 Prague incorporated the territory of several currently growing suburbs and expanded it's total area to 5250 acres. In 1921 the "Great Prague City" was created by an annexation of 37 additional communities and the gradual territorial expansion of Prague continued, reaching a total area of 52,863 acres. The continuous and dynamic physical development of Prague brought about further administrative expansion to a total area of 116 square miles through the incorporation of 21 additional communities in the second half of 60.
In 1974, during the elaboration of the latest city master plan, the government of the Czech Republic approved the additional expansion of Prague's administrative territory to the present day area of 193 square miles.

The growth of the number of Prague's inhabitants is shown in the following figures:

<table>
<thead>
<tr>
<th>the year</th>
<th>population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400</td>
<td>50,000</td>
</tr>
<tr>
<td>1600</td>
<td>60,000</td>
</tr>
<tr>
<td>1700</td>
<td>40,000</td>
</tr>
<tr>
<td>1800</td>
<td>75,000</td>
</tr>
<tr>
<td>1900</td>
<td>514,000</td>
</tr>
<tr>
<td>1930</td>
<td>848,000</td>
</tr>
<tr>
<td>1950</td>
<td>933,000</td>
</tr>
<tr>
<td>1970</td>
<td>1,143,000</td>
</tr>
</tbody>
</table>
3. The physical planning of Prague city

3.1 The organization of physical planning process

The Department of the Chief Architect for the capital city of Prague (Prague City Planning Office) is an autonomous institution of the Prague City National Committee. The Department of the Chief Architect for the capital city of Prague (DCACP) is fully responsible for physical planning for Prague city and it shares with the Central Bohemian (Regional) National Committee the responsibility for the physical development of the Prague agglomeration. The city planning office cooperates with other departments and offices of the Prague City National Committee (PCNC) such as the Department of Construction, the Department of City and Regional Planning and the Department of Social Relations as well as relevant institutions and offices at the state and federal levels on various tasks concerning the comprehensive physical development of Prague. The PCNC subordinate to the government of the Czech republic. In the field of physical planning the Ministry for Technology determines the principles for the formation and the protection of the housing environment as well as the assurance of a high architectural and aesthetic levels in building and in physical planning.

The DCACP elaborates physical planning documentation of itself - in the case of the most important plans - or orders and directs the elaboration of appropriate planning documents at specialized planning and projecting institutes. The approval and adoption processes of selected physical plans are organized by the DCACP and the adoption is performed by the Council of the PCNC. The city master plan as a most important physical plan for comprehensive development is finally adopted by the government of the Czech republic.

City physical planning documents can involve specialized tasks such as transportation planning, utility service and environmental planning or can be composed of comprehensive physical approaches. Comprehensive physical plans involve the division of certain areas in the spheres of economy, social aspects and environmental as well as individual physical fields. Comprehensive physical plans are differentiated by purpose and liability, in accordance with the size of the territory that has been divided and the time span that is involved. Physical plans are divided according to purpose and liability into
the following categories:
- territorial prognoses
- territorial plans
- territorial projects

Territorial prognoses predominantly stipulate the basic demands of territories that are to be met in long term periods. Prognoses are developed for alternate solutions. Prognoses need not to be approved and, therefore are not usually bidding for subsequent planning purposes.

Territorial plans usually concern medium-range developments having close relation to economic, social as well as environmental aspects and representing more precisely specified goals and policies. These physical plans have to be approved by municipal authorities and in special cases by the government of the republic. In this context, the city master plan can be mentioned as specific kind of territorial plan.

The functions of the territorial projects consist of stipulation of planning conditions for the conduct of area specific and time programmed construction in the next 3 to 10 years. The projects have to be elaborated on the basis of actual investment program and are contingent on the approval of municipal and local councils.

Plans are divided as follows on the basis of the territorial area that they address:
- plans for large territorial units
- plans for medium size territorial units
- plans for community units

These three principal plans usually apply to the territorial subdivisions and time frames depicted in the following chart:

<table>
<thead>
<tr>
<th>Extent of Territory</th>
<th>Time Period</th>
<th>Scale in metric system</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Long-range</td>
<td>Medium-range 5-10 year</td>
</tr>
<tr>
<td>Settlement unit</td>
<td>30-60 year</td>
<td>10-30 year</td>
</tr>
<tr>
<td></td>
<td>Territorial Prognosis</td>
<td>Territorial Plans</td>
</tr>
<tr>
<td>Settlement unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community unit</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table shows the scale of the plans in different units, with options for scale ratios from 1:5000 to 1:25000.
Consequently, it is often the case that those prognoses, plans and projects do not correspond in form to the theoretical descriptions mentioned above. Two principal and comprehensive physical plans for the city of Prague have been elaborated during the last five years. In 1976 the Master Plan of Prague City was adopted and in 1980 the first draft (preliminary proposal of the Territorial Programs for the Prague Historic Urban Reservation was finished and discussed within relevant departments of the PCNC.

3.2 Brief Description of the Master Plans for the City of Prague

The physical development of Prague's city was directed in the past through several approved City Master Plans. The first draft of the comprehensive master plan was prepared in 1998 within one year by an avant-garde of Czech architects and city planners. The permanent planning process of Prague's development started three years later and led to the adoption of the first regular master plan in 1969. A year later, the city master plan was completed by a long range development study for the entire Prague agglomeration. This study has created a sufficient base for optimal progress in the city's future physical development as well as any desired administrative extensions of the city territory. In 1968 the revision of the 1969 master plan was completed. He reflected new conditions for possible physical development within the territory of Prague agglomeration.

As said earlier, the latest master plan for Prague city and the master plan for Prague's agglomeration were completed in 1976. Both master plans address Prague's development until the year 2010 with an initial phase ending in 1990. In this plan these strategic problems of comprehensive urban development were considered and approached in details within the following spheres:

In the economic sphere:
- the economic position of Prague in relation to the state, the Central Bohemian region as well as the agglomeration,
- the development in Prague's economic structure as specified in individual economic sectors,
- capital investment for general development involving city and state demands on the basis of available capital,
- economic aspects revised by the standard of living,
In socio-demographic spheres:
- the socio-cultural role of the city in the context of the state, the region as well as agglomeration
- city demographic structure as it pertains to natural growth as well as migration
- social structure and trends in social behavior,
- citizens life styles,
- specific social programs in housing, renewal, transportation and other fields,

In the environmental and physical spheres:
- the statement of environmental regulations and standards; trends in the "environmental behavior" of citizens,
- city physical development and the position of the city within Prague's agglomeration, and the settlement network of Czechoslovakia,
- the concept of the physical structure of the city:
  - the central city system and land use patterns (functional distribution)
  - the structure of spatial composition
  - the technical infrastructure encompassing transportation and utility services
- stipulation of development and redevelopment areas as well as specifications of successive procedures in building,
- the deliniation and specification of measures for protected territories, in the administrative sphere:
- the organization of redevelopment and development processes,
- specification of administrative as well as legislative instruments for the implementation of design objectives

During the elaboration of Master plan, emphasis was placed on the insuring of appropriate flexibility and universality for the plan as an answer to potential unpredictable conditions that could appear in the course of long-term development.

The physical content of the city master plan consists of verbal and graphic parts. The verbal part includes a detailed descriptive report with extensive data and figures explaining the problems in question. The descriptive report is followed by an abstract of development objectives and policies called Development guidelines which are compulsory for any activity related to city physical development.
The graphic part involves three principal maps for development to the year 2010 on a scale of 1:10,000. The first map depicts land use, the transportation network as well as designed development and redevelopment areas. The second map is an illustration of spatial composition with protected urban and natural reservations while the third plan is devoted to design of utility services and environmental factors. This set of principal maps is supplemented by several dozen supporting maps and schemes at a scale of 1:25,000.

Less than two years later the city master plan was integrated with the general plan for the development of Prague. This document has been adopted and concerns physical development in precisely specified terms for a five year period beginning in 1980.

In accordance with previous experience, the validity of this master plan is estimated at 8-12 years from the time of adoption.
3.3 An elaboration of the test Master Plan for Prague

The Master Plan for the City of Prague from the year 1976 was elaborated on the basis of an integrated city model. Although this model was elaborated with the Master Plan in mind for purposes of improving efficiency and reducing implementation time, it is also applicable to other types of physical planning documents. Upon completion this interdisciplinary model will be almost fully automated and computerized. The city model as well, will be interconnected with corresponding development models and systems at the state and federal levels. It is assumed that the model will be continuously upgraded. Presently, this model is still being developed and existing phases of this development system are in current use as well as at the stage of experimental operation.

The model is basically founded in the general process of physical development in Czechoslovak settlements that can be schematically depicted as follows:

[Diagram showing the process with labeled circles and arrows: Needs of the City → Planning Process → Urban & Architectural Design → Implementation Process → Needs of the City]
Only the first two steps will be discussed in this paper.

The model for the city's physical planning consists of two parts - one analytical and the other synoptic (analytical). The model is depicted on the opposite page and has been compacted for the purposes of this study. The analytical part contains 5 phases and 4 are treated within the scope of the data base.

Phase 1 encompasses the collection, up-dating and ranking process as well as other data manipulation. Data are obtained from various sources such as the Bureau of Czechoslovak Census, the state information system, various types of surveys, urban plans and projects that have been approved or adopted as well as all building implementations. The data base contains past, contemporary and projected information on qualitative and quantitative levels in the city's economic, social, environmental and physical fields. For elaboration of master plans the data is usually grouped into individual census tracts (Prague City has 520 census tracts).

In phase 2 various types of data analysis can be performed. One of the goals of this phase is the determination of the contemporary qualitative and quantitative potential for the city in individual variables within the data base. Within this phase, the weighing of variables for relative importance (one of the most important processes in this interdisciplinary model) is also conducted. The weighing is carried out at various levels beginning by the weighing of variable systems, through individual subsystems and ending with the weighing of selected variable groups in individual census tracts. For instance, the economic, social and environmental systems of the model are weighed at first and this is followed by a weighing of individual variable groups such as eco-biological, aesthetic-psychological and land use factors. Finally a weighing of individual variables such as housing, social services, institutional facilities, industry, recreational facilities, transportation and utility services is undertaken. Evidently this special parametric process is performed by a group of decision makers and the resulting decisions are placed within data banks. Specialists from all fields related to comprehensive urban development are represented in the weighing committee. Variables having economic bases are also assessed on monetary principles but the usefulness of such an assessment is restricted to the economic sphere.
The City Development Model

3 Synthetic Phase

A - Phases that are entirely or almost fully computerized

B - Partially computerized phases

C - Marginally computerized or non-computerized phases
Among other activities at this stage we may site data selection for certain programs. Should the needed information be unavailable or outdated in the case of certain programs, a specific order for updating such data is prescribed.

Phase 3 represents the assessment of relative and absolute values of individual or grouped variables over a certain projected period. Qualitative and quantitative measurements to be used in the prospective assessment of data pertaining to individual variables, their groups, sub-system and systems are originally generated from data provided for the long-range developmental aspects of the Federal Development Plan. These can be modified to a certain extent and supplemented by additional measurements that are closely related to the current qualitative and quantitative trends within the city. The resulting measurements become tools for assessment and are located within a technical manual entitled "The Territorial and Technical Principles for the Development of the City". This document has been approved within the scope of phase 20.

In the first, the analysis takes place at the level of the added value resulting from the use of labor input or from natural expansion within a determined period. As an example we can mention the relative growth of land values in locations where the stations of the new mass transit line are to be developed or the increasing value of regularly mentioned city parks. The second assessment is derived from socio-economic relations that result from projected scenarios involving social demands on one hand and economic, technical and environmental implementation possibilities on the other hand. The increase in the relative value of farm land as the result of growing social demand for food products and the worldwide climb in food prices could serve as an example. The assessment is treated through economic and relative weighing methods based on joint indexing techniques. This weighing procedure is widely used in comprehensive, multidisciplinary approaches.

The activities as well as processed data within this phase regressively influence phase 19 pertaining to the evaluation of alternative solutions of city development plan.

Process within the scope of phase 4 introduces the final step in the analytical sphere of this model for comprehensive development. The assessment of the degree to which each city area unit may provide conditions and or
opportunities for future growth is treated in this section. The principal factors detailing these opportunities are assessed by the variable for developmental instability. These factors include economic, partially social and mainly environmental values such as appearance, amenity, land use, transportation, physically and climatically related values (see below: the description of model components). The output depicts area feasibility and site selection for optimal future redevelopment and development of the city. These can be obtained in various forms according to individual needs. The forms include screen display as well as documents that provide maps, charts and t The results can be provided in individual and grouped variables as well as in overall development suitability variables for individual area units.

Phase 5 involves the elaboration of various types of required surveys, supporting studies as well as the development of analytical and assessment techniques. The processed information is then included into the information system.

The synthesis of the model encompasses planning and physical planning streams (processes). The physical planning stream includes 10 basic phases. Phase 6 is a core stage of this synthetic where the entire concept is developed. The defining of the tasks, the formulation of the methodology of the synoptic process as well as the conceptual and optimizing principles and techniques are discussed, developed and selected in accordance to individual physical planning purposes. Conceptual principles encompass the statement of physical planning objectives and the formulation of general policies. The utility of the computer at this stage is still very limited and represents only the selection of appropriate standard information covering regular conceptual approaches can be enriched by data obtained from step 20 (the adoption of city planning documents) as well as from the National Development Plan.

Phase 7 includes the elaboration of alternate solutions for the redevelopment and development of the city in accordance with planned development principles. A set of solutions is based on the following conceptual approaches: territorial development covering only areas in which redevelopment and
development are feasible (step 4 - feasibility assessment). Unless all
genral objectives for city development can be fully achieved by any
alternative the following conceptual approach is undertaken,
- territorial development ensuring planned city development regardless the
availability of areas in which development is feasible,
- territorial development representing a compromise solution between the
above mentioned alternatives.
By the specification of principal conditions for the construction of re-
development and development areas, as recommended in phase 4, physical
planning systems (or urban design models) were especially developed for
Prague City. These structural physical planning systems can be divided
into specific and complex urban design models. The specific models are
usually utilized for proposals involving individual components such as the
organization of the city's central system, the transportation network or the
utility service structures. These models are predominantly based on various
modifications of locations theory and PERT theory and are predominantly used
for redevelopment processes in existing urbanized areas. Complex models of
structural physical planning were developed for the formation of new city
development on the basis of optimal social, environmental and economic
parameters in comprehensive settlement units. These models consist of fully
equipped settlement nuclei (elements) and urban assembly systems such as
linear, grid network or satellite patterns. For the purposes of the Master
Plan these urban design systems vary in organization of land use structure,
transportation and utility service patterns as well as in composition involving
the height of structures, layout systems and densities. Should any of these
computerized systems not fit specified territorial conditions, then such areas
are projected by classical methods of individual design applied by a team of
urban specialists.

Phase 8 represent an evaluation of alternate drafts, the selection of
the optimal solution and it's preliminary approval. For the evaluation
process various methods such as a modified cost - benefit analysis, an input-
output analysis as well as a comprehensive analysis based on the relative
weighing of individual elements of preliminary plans are used. Evaluation
methods for economic aspects of the drafts are generally computerized. However the principal emphasis for alternative evaluation is placed on a comprehensive relative weighing analysis which takes into account economic factors as well as social, aesthetic, historic and environmental issues. In this evaluation method point or index weighing techniques are utilized. This process is implemented by the weighing committee on the same principles described in phases 3 and 4.

After the alternatives have been evaluated and discussed by appropriate municipal authorities an optional solution is finally selected for adoption. Selected preliminary drafts of plans are discussed by all organizations concerned with or entitled to comment on proposals. The City Planning Council considers all admonitions and on this ground prepares the direction for the completion of final plans.

Within stage 9 or with the assistance of processes treated in stage 7, a selected plan is modified and developed in appropriate detail under specified directives for plan completion.

In phase 14 selected redevelopment and development areas of the draft are projected in detail. This is elaborated with the assistance of phases 12 and 13.

Phase 12 involves an elaboration of detailed urban design models, that are developed on the principles stated in step 11 - the development of urban design systems. These comprehensive models are designed in detail from viewpoints including land use, spatial composition, environmental as well as construction. As required by step 8, then alternate models are computerized and used in the design of areas in which development has been problematic. This process is not yet developed in sufficient quality. Therefore this phase is considered as an auxiliary process and a majority of problematic areas are finally projected by a team of urban specialists using classical method of urban design. This conventional process is treated within the scope of phase 13. Outprints of phases 7, 9, 12, 13 and 14 are predominantly provided in graphic forms which include maps and screen displays as well as charts.

Phase 15 represents a more detailed revision and elaboration of the social, technical, economic and environmental impact of proposed city development then was initially projected in step 7. Some influences are studied in concrete or
simulated conditions using physical modeling methods. In the final phase (10)
physical planning document elaborated to required details is adopted by
relevant municipal and in some exceptional cases by authorities of the Republic.
At that time approved material becomes a compulsory document for relevant
physical activities within city territory.

Steps 16 to 20 express a city planning flow chart that is considered as
an integral component of comprehensive physical planning.

Within step 16 comprehensive development principles of the city are
elaborated on the basis of two planning materials. The first is a draft
proposal for city development prepared to reflect interests at the city level
while the second involves city development objectives derived from the
National plan for development. The proposal of prospective city development
as viewed by the city is established at phases 2 and 3 (data analysis and
data assessment) and contains the demands of the city for optimal development
in the economic, social, cultural and environmental spheres. The tasks
assigned to the city contain principles of complex city development from the
state's viewpoint and are obligatory, as they follow from concrete conditions
and possibilities within city.

Phase 17 includes the elaboration of planning alternatives based on
development principles stated in the previous step. The evaluation of
alternatives, discussion upon alternatives and the selection of an optimal
solution as well as the preliminary approval of such a solution are activities
involved in step 18. These processes are similar to those described in phase 8
involving evaluation of physical planning alternatives. At step 19, selected
policy draft is adopted and elaborated in specific details with some assistance
from processes found in phase 17. At final step of the planning process -
phase 20 - the adoption of the planning document takes place and the document
becomes a compulsory guide line for the elaboration of subsequent physical
planning materials.

This comprehensive physical planning model for Prague's City consists of
three distinct, interdependent models described below:

- the economic-technological model
- the socio-demographic model and,
- the complex environmental model
All individual models have been substantially simplified to permit their utilization within the sophisticated and comprehensive model of the city. Therefore all single models encompass only substantial information and selected processes that participate in the concept of overall city development.

The economic-technical model consists of two submodels. The first is the macroeconomic submodel dealing with the inherit economic base of the city. This submodel is divided into individual economic sectors. The second submodel, or the city operational submodel focuses upon the economic factors of city management, transportation and utility services as well as upon the construction and reconstruction of the city.

The socio-demographic model is formed of three submodels. The demographic submodel considers city population development and basic population characteristics such as age and family size structures. The social submodel concerns the lifestyle of city inhabitants, standards of living (including income structure) and education levels that influence social characteristics as well as the outlook of city social behavior. The physical implementation of state and local social programs in selected fields such as housing, education, working condition, medical care, recreation and culture is treated within the scope of the third submodel.

The environmental model is the most complex model and is still being developed. Currently, this model consists of the eco-biological, aesthetic-psychological, land use and technical submodels. The eco-biological submodel addresses the ecological balance and optimal environmental condition for city goers. In this submodel various environmental elements such as individual natural components, noise pollution, natural and man-made hazards, health conditions of inhabitants and other factors proceeded.

The aesthetic-psychological submodel is created on spatial composition factors, cultural aspects of physical structures and the elements forming the social-psychological image of the city. Spatial composition is studied in relation between natural and man-made components, in relation between individual man-made component as well as between natural components themselves from a standpoint of legibility, diversity, accessibility, congruence and other aspects.
The conservation and proper utilization of the cultural heritage of physical structures protected for historic, aesthetic as well as technical reasons is pursued in the cultural sphere of this submodel. The third region, or the so called "psycho-social atmosphere" of the city deals with factors that affect users of the city from the standpoint of comfort, convenience, vitality, enjoyment, pleasure and meaning.

The submodel for land use has been developed with the emphases on activity location and land use relations, qualitative and quantitative aspects of functional facilities as well as transportation and utility services.

The last, or the technical submodel concerns physical conditions and various processes of maintenance and revitalization of physical structures as well as the continued physical development of the city.

Each of these models and submodels is developed in accordance with basic, well known system theory involving elements and linkages. Each model and submodel includes two main streams of design - the physical planning process (or developing model process) and the planning process (or program formulating process).

Each model and submodel is divided into two principal phases consisting of analytical and synthetic parts. The analytical process consists of analysis and assessment of information with outputs that specify needs, determinants and possibilities. The synthetic or projection process involves, in brief, the following phases: the specification of objectives, methodology formulation, the elaboration of alternatives, alternative optimization, policy specification and the definition of imperatives.
4. Principal general objectives for the comprehensive development of Prague

Principal development objectives for Prague are based on generally recognized principles of complex development in Czechoslovak settlement units and systems. These are founded on mutually balanced linkages between three fundamental factors:

- the economic organization of settlements - focusing primarily on the efficient management, operation and physical development of settlement units - with the purpose of their prospective development,

- the optimal environmental conditions\(^1\) - ensuring the harmonious coexistential development of society and its artificial production on one hand and the natural evolution on the other hand,

- the implementation of demographic goals and determined social as well as cultural objectives and policies\(^2\) - within the competence of urban planning and the physical development of settlements. These contribute to the ensuring of continued desirable development in life style and to the growth of standard of living for all inhabitants.

Specific objectives of long-term planning for Prague are derived from the interaction of the following elements:

- contemporary and perspective demands for Prague's development,

- development determinants stemming from conditions specific to Prague,

- contemporary and targeted economic and financial resources available,

- goals which are determined and specified for Prague in higher echelon documents at the republic or federal levels.
In keeping with the above mentioned general goals the following peripheral objectives for the future of Prague's development were stated:

(Objectives in the economic sphere)

- To develop Prague city (as well as Prague's agglomeration) as a capital of the federal state - as the governmental, administrative, residential, scientific, commercial and business, cultural and transporation center of Czechoslovakia.

- To increase the number of job opportunities to a total of 725,000 in 1990 and 770,000 in 2010.

The structure of job opportunities that is derived from the position of Prague in the State Development Plan as well as from Local Development Plan will reflect an increase of job opportunities freedom mostly in the 4th and 3rd economic sectors as well as in selected traditional fields of the second economic sector involved in the production of sophisticated and advanced technology.

The basic development trend specifying the changes in the number of working opportunities can be expressed through a comparison to contemporary figures deemed to be equal to 1:

2nd Sector: 

<table>
<thead>
<tr>
<th>Activity</th>
<th>( \leq 1 )</th>
<th>( \geq 1 )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>manufacturing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>construction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>energy production industry</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3rd Sector: 

<table>
<thead>
<tr>
<th>Activity</th>
<th>( \leq 1 )</th>
<th>( \leq 1 )</th>
<th>( \leq 1 )</th>
<th>( \leq 1 )</th>
<th>( \leq 1 )</th>
<th>( \leq 1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>wholesale and retail services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>culture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>physical activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>medical care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hotels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>government administrative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>other administrative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transportation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>public utilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4th Sector: 

<table>
<thead>
<tr>
<th>Activity</th>
<th>( \geq 1 )</th>
<th>( \leq 1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>education</td>
<td></td>
<td>( \geq 1 )</td>
</tr>
<tr>
<td>research</td>
<td></td>
<td>( \leq 1 )</td>
</tr>
</tbody>
</table>
- To promote the proportional economic specialization of particular city areas as dictated by specific area conditions and possibilities,

(Objectives in the social and demographic spheres)

- To ensure a proportional growth of the city so as to not exceed 1,270,000 inhabitants (Prague agglomeration 1,890,000 inhabitants) in 1990 and 1,390,000 inhabitants (Prague agglomeration 2,150,000 inhabitants) in 2010. This objective results from contemporary realities in the state settlement of ahern. Contemporary Czechoslovak urban structure represents dense settlement networks mirroring the historic urbanization of the country. The average theoretical settlement density of the CSSR shows 4.18 sq. miles per settlement unit and 34.78 sq. miles per settlement unit having 2,000 and more inhabitants (data from 1978).

The principles of Czechoslovak urban development policy in the face of this unfavorable situation in settlement structures can be briefly characterized as follows:

- the development of settlement systems that will reflect specific economic, social, environmental and physical conditions and possibilities for units with the respect to relatively balanced settlement patterns within the whole country,
- the gradual reduction in the density of settlement units,
- the development of urban structures within evolving settlements to the extent possible.

- To gradually ensure respectable qualitative and quantitative conditions in housing, education, work and recreation for all inhabitants as well as to the city in accordance to projected standards of the republic or local level,
- To ensure a balanced social structure of city inhabitants as a substantial factor for the prospective development of the city,
- To create specific urban conditions attracting a young and professionally qualified population,
  This is in view of the higher percentage rate of the elderly in the population (mainly retired people) in comparison with corresponding figures in other larger Czechoslovakian cities,

(Objectives in the physical sphere)
- To develop Prague city as an intellectual and physical "core city" of Prague's agglomeration
  Although the lack of congruence between the physical area represented by Prague's agglomeration and its core area remains unresolved, this is only secondary to the achievement of the above mentioned objective.
- To develop the city (as well as the agglomeration) as a self-sufficient urban organism with a reasonable surplus in facilities for business as well as recreational and cultural resources to meet demand in related, affected areas.
  A self sufficient urban organism is one in which job opportunities as well as the quality and quantity of business, service and recreational facilities are sufficient in number to meet reasonable basic demands by the population. The principle of the self-sufficient area is also to be applied to the city urban units - districts, communities and neighborhoods. The application of this principle will make possible the reduction of physical distances between principal human activities. This will shorten work trips, recreational trips as well as shopping and service trips.
- To create the city as a proportionally compact (dense) urban unit within a framework of optimal environmental conditions, contributing substantially to the reduction of functional linkages as well as reducing energy consumption.

This goal promotes the formation of build up areas with higher employment and residential densities and is primarily concerned with areas under development and areas scheduled for renewal. This goal reflects current and future Czechoslovak urban development policy based on new legislation protecting quality from land against alteration for various urban purposes. This legislation was adopted by federal authorities in 1977 and was in response to the previous level of per capital agricultural land in Czechoslovakia (0.48 ha/capita). The lowest acceptable economic rate of farm land is considered to be between 0.8-0.9 ha/capita.

- To adopt the renewal, reconstruction and maintenance processes as integral and continuous components of the comprehensive development of the city,

- To develop a city central system within the framework of existing conditions as a balanced system that is regularly laid out, hierarchical as well as policentric and that will inherit the dominant portion of a powerful city center - as outlined by the Prague historic urban reservation.

The elements of this central system will ensure a sufficient quality and quantity of employment facilities within the determined areas being served. The implementation of this objective will help to relocate the job opportunities that are at the present time primarily concentrated in the CBD area to other city centers which are spread out within the entirety of the city's territory.
- To create an integrated transportation system based on partnership between mass transit and individual transportation as well as freight transportation, making accessible to all inhabitants, working people and visitors a great degree of mobility within the city area as well as making possible efficient distribution of commodities,

- To ensure an adequate distribution of utility services such as energy for heat, electric power, gas, water, and communications on one hand and the removal of solid and liquid wastes through appropriate treatment and disposal facilities on the other,

(Objectives in the environmental and cultural spheres)

- To protect and properly utilize the physical historic heritage which is represented by former city development as a unique and specific factor within the earlier future identity of the city,

- This means that the Prague historic urban reservation (PHUR) as well as other significant historic complexes spread out within the city area must permit as vital elements of social and physical activities,

- To create respectable environmental conditions for living, working and recreation by all inhabitants, working people as well as visitors,

- To strictly protect and enhance the physical components that are exceptional as well as natural such as ground, water areas and streams, parks and forests, natural reservations for flora and fauna that form together with man-made structures the spatial outlook of the city,

- This goal ensures the performance of fundamental spatial and land use analyses of importance elements that make up the physical composition of the city. Technical utilization of these elements through functional feasibility and feasibility in construction with specificity as to the type
and height of structures will contribute to desirable spatial composition.

- To ensure an acceptable quality of air, water areas and streams, clear surface and underground spaces, the reduction of noise levels, the formation of a relevant quality and quantity of biological components and the mini-

mazation of possible natural and technical hazards,

Despite clearly stated optimal environmental quality standards, in some cases such as the reduction of noise levels it will be impossible to achieve the required norms. In such cases, individual noise standards that are specific to different forms of land use are presented for particular areas of the city.

Following an enumeration of selected development goals, I at first intended to conduct a comparison between all aspects pertinent to physical planning in the two cities. There are however certain conceptual gaps within available planning documents as the result of slight diversities separating the planning approaches in the two cities. When combined with an obvious similarities in objectives, these necessitate that we restrict the forms of our study to comparison of land use goals.

These will be divided into five principal categories:

- industrial facilities
- centers and social facilities
- housing
- transportation
- utility services

Objectives pertaining to industrial facilities:

- To favorably develop existing facilities in future oriented industrial fields and to establish new manufacturing fields only when these are directly connected with the needs of the city.
The contemporary industrial structure of Prague city represents a wide spectrum of various manufacturing facilities. This objective reflects a planned economic development of the whole country towards proportional specialization and adequate equilibrium within the industrial potential of settlement networks. Therefore, selected industrial fields will be developed and redeveloped fundamentally on the basis of intensive (technological) development in Prague.

- To gradually concentrate selected industrial facilities into industrial parks,

It is projected that about 70% (1200 ha) of the required industrial areas will be concentrated in industrial parks. These industrial parks that benefit from extensive space are created in the entire city, to the exclusion of the CBD area. These are equipped with corresponding supporting facilities and structures such as energy and water supply, waste removal and treatment plants as well as appropriate freight and personnel transportation facilities. The different quality and capacity of related supporting facilities within industrial parks will ensure desirable specialization in the economic structure of the city. The only industrial facilities having non polluting production processes from an environmental viewpoint and having the possibility of expansion to an optimal size will remain at existing locations.

Objectives for city centers (including employment facilities in the 3rd and 4th economic sectors) and social services:

- To develop a hierarchically organized network of city centers that are equipped with social services and institutional facilities of appropriate quality and quantity,
- To enhance the further development of district and regional centers and to reduce at the same time the excessive concentration of job opportunities within the CBD,

As proposed, Prague's central system consists of a principal city center containing the Prague historical urban reservation (PHUR) with linear centers growing from it and 5 district as well as regional centers. In addition about 30 community centers and several dozens of neighborhood centers should also be mentioned. The capacity and qualitative level of particular city centers is derived from valid or proposed standards for social facilities and from the number of inhabitants served. Social facility standards are graduated at the levels of basic, higher or special standards. Basic standards express optimal basic needs of inhabitants of neighborhoods, higher social service standards relate to the needs of larger urban residential units such as communities and districts and special standards express optimal needs of inhabitants and visitors at the city level.

Standards are specified at individual qualitative levels for the following facilities:

- educational facilities
- health facilities
- business and commercial facilities
- services
- recreational facilities
- accommodation
- To preferentially develop centers of low grade level within neighborhoods and communities that are under construction or renovation,
- To complete central facilities in recently built or renovated areas,

(Objectives for business, commercial and service facilities)
- To promote the expansion of basic commercial and service facilities through new construction as well as renovation and reconstruction of existing facilities in city areas that are insufficiently equipped,
- To gradually complete commercial and service facilities of higher standards in principal city centers,
- To preferentially locate business and service facilities of special standards such as fashion good shops and international restaurants in the PHUR area and ultimately to other main centers,

(Objectives concerning educational facilities);
- To equip every residential area with nursery schools of adequate capacity,
- To build new facilities or modernize existing facilities in conformity with specific local as well as city needs, the development of the school system and innovation in educational methods,

Currently particular attention is devoted to the development of new types of 4 and 5 year special secondary schools providing the combined theoretical education of vocational technical schools, as well as the practical learning of apprentice schools,
- To gradually equip all elementary as well as secondary schools with related recreational facilities such as sports facilities, clubs and civic centers for students.
- To complete secondary schools and university levels with an adequate capacity of dormitory space,
- To locate new apprentice and vocational schools (technical high schools) as well as new university schools near corresponding production, service or research facilities and institutions, thus ensuring mutually advantageous cooperation.

This objective began to be implemented several years ago. The schools formerly located in the inner city are and will be fundamentally relocated in suburbs with the possibility of area development in the future. In inner city areas only secondary and higher level schools benefiting from the relationship with city center activities will be redeveloped and developed. These will consist of business and commercial schools, schools of various social service disciplines, schools of fine and applied arts as well as other schools.

- To maintain the current number of schools at the university level.

This goal reflects the newest federal thinking in the area of university location permitting balanced university development in close relation to the number of inhabitants and the economic specialization of particular Czechoslovak cities (Goals involving health facilities):

- To gradually complete the network of health facilities and to generally develop appropriate health facilities in those residential areas that are being constructed or reconstructed,

- To modernize existing facilities of all types and grades in a way complying with prospective qualitative and quantitative norms as well as reflecting the state of the art in new treatment methods and techniques.

- To complete the development of the Charles University Health Center and to supplement it with appropriate research facilities,
Two alternate ideas have been proposed for this top grade health care complex. The first alternative consists of the current location at which many existing buildings can be utilized advantageously in the future, while area for further projected expansion is located. The second alternative, involving the construction of a new health center in the suburbs is enormously pretentious from the viewpoint of capital investment. The final decision about a location has not been yet made.

- To complete a network of kindergartens

The fulfillment of this objective is very important task in view of the high percentage of employment for women in the CSSR

(Objectives involving recreational facilities):

- To distribute recreational facilities and parks equitably throughout the city,
- To give priority to the development as well as redevelopment of all types of recreational facilities serving to the participating recreational needs of individuals in the physical and intellectual sense,
- To ensure the completion of basic recreational facilities in housing projects that are being built,
- To maintain all historic buildings as well as urban and natural reservations,
- To complete the interconnected system of open spaces,

The proposed system of open spaces in the city encompasses the partially interconnected set of historic as well as newly created gardens, parks and other open spaces in inner city territory. These are completed by protected open spaces with natural landscapes more or less radiating from the city center. Radial open spaces that join the hinterlands of the city's landscape
with a centrally located cluster of inner city gardens provide short and intermediate term recreation of a high quality to the inhabitants as well as visitors of the city.

This will increase the average area of recreational open space from the present figure of 50 m² per inhabitant to 65 m² per inhabitant in the year 2010. Park space per inhabitant will increase from 7.2 m² in 1970 to 9.4 m² in the year 2010.

- To preserve park lands against the conversion for other uses within the city,

- To develop the open spaces and recreational potential of embankments,

(Objectives pertaining to accommodation):

- To promote the construction of all types of temporary housing such as hotels and motels as well as the conversion of appropriate historic buildings and complexes for this purpose,

- To increase the capacity of accommodation facilities to at least 90,000 beds by the year 2010,

  This goal represents more than a 150% increase in over the current accommodation. The majority of newly acquired beds will be located within the inner city area.

(Objectives concerning housing):

- To permanently raise qualitative as well as quantitative standards in housing,

  It is assumed that dwelling space will reach 28-30 sq. meters per inhabitant by 1990. Contemporary figures for the Prague are at 20-22 m² per inhabitant
- To construct at least 36,000 new dwelling units within the time period represented by each 5 year plan,
- To reconstruct after the year 1990 at least 20,000 dwelling units in existing residential areas within time period represented by 5 year plan,
- To obtain after the year 1990 at least 10% of the total amount of new dwelling units from areas renewed within time period represented by 5 year plan,
- To achieve a 3% surplus in dwelling units by the year 2010,

This goal will make it possible for all city inhabitants to select a residence located in an area that is compatible with the focus of family activities,
- To create new housing projects and renewed residential areas with residential densities of at least 350 inhabitants per hectare (corresponding to 142 inhabitants per acre)

This goal is brought about - as mentioned above - by lack of appropriate land for urban development. These high densities will naturally lead to the functional horizontal stratification of new housing projects reflecting efficient utilization of residential areas and the most convenient use of building space. In this system the underground floors are devoted to utility services, stores and parking. Retail and shopping spaces, services, cultural and covered sport facilities are placed on the ground and in part on first floors. Other floors are used for housing while the top floor houses kindergartens and nursery schools.
- To promote housing as an inherit and desirable function with the PHUR,
- To create the new housing estates as relatively self-sufficient city units covering within their areas the basic needs in social and community services as well as employment facilities,
- To ensure a proportional variety of types of residential buildings as well as a proportion in the size of dwelling units corresponding to prospective needs,

- To increase the identity of new housing projects and to protect the identity of selected residential areas,

  This goal is planned to prevent contemporary monotony of new residential areas. In the Master Plan it is assumed that about 85% of new dwelling units as well as 65% of structures for community services are to be built through the use of construction systems assembled from various prefabricated components. Thus, from the economic viewpoint, efficient construction systems and methods will be developed as well as produced in a wider spectrum of building applications involving layout as well as facade systems. These pre-fabricated systems will be produced in limited quantities. Reductions in production will be made possible by continued evaluation and frequent modification in models.

In areas, which will be centralized, the degree to which prefabricated construction systems are utilized will depend on prevailing physical and spatial conditions. In the PHUR as well as the adjacent inner city ring tradition construction methods will be predominantly used while new structures within renovated areas in the suburbs will be primarily built through the use of pre-constructed components.

- To ensure appropriate environmental qualities in residential areas,

  This objective concerns a wide range of environmental factors affecting the quality of housing but only selected factors are mentioned here. Noise levels have been established at 55 dB for new and renovated residential areas and at 65 dB for reconstructed and maintained housing. As well as
relevant quality standards for air, water and city grounds, a quantity of open space and gardens are specified for individual city territories. The achievement of these standards is to be treated mainly by the reduction of surface transportation predominantly with residential areas the allocation of heating systems and fuels for the production of heat energy, wider utilization of natural spaces in block constructions for the creation of gardens.

- To promote walking as an optimal mode of transportation within community as well as neighborhood areas.

For short distances, walking can be considered as the most natural form of transportation, having in addition advantages that are significant from an economic, environmental and physical standpoint.

Therefore the new residential areas are to be formed as a well developed network of pedestrian transportation,

(Objectives for transportation):

- To create an integrated transportation system based on personnel as well as freight transportation utilizing individual transportation subsystems on the basis of technical/economic specifications and actual city demands.

The concept of passenger transportation is based upon the following projected trip statistics:
<table>
<thead>
<tr>
<th>ACTIVITY ↓</th>
<th>WORK</th>
<th>RECREATION</th>
<th>SHOPPING &amp; SERVICES</th>
<th>JOB RELATED TRIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequent Activity</td>
<td>Occasional Activity</td>
<td>Frequent Activity</td>
<td>Occasional Activity</td>
</tr>
<tr>
<td>Nearest of Residence</td>
<td>Nearest of Residence</td>
<td>CBD, OC</td>
<td>Nearest of Residence</td>
<td>CBD, OC</td>
</tr>
<tr>
<td>Walking MT, Bicycle, Moped</td>
<td>Walking Bicycle, Moped</td>
<td>Automobile MT, To</td>
<td>HDS Walking, Bicycle, Moped</td>
<td>MT, MTO, HDS, Automobile</td>
</tr>
</tbody>
</table>

Explanatory notes: CBD - Central Business District
OC - Other Centers
MT - Mass Transit
HDS - Home Delivery Service
To - Paratransit

* Order of modes express the intensity of use: first mode will be used most frequently

- To create a city transportation system that is derived from the specific physical conditions prevailing in the city,

- Specific physical conditions within Prague's inner city as well as the existence of historic structures under protection have in combination with the enormous territorial demands of individual transportation systems (have) necessitated that mass transit be given priority in the development of transportation across the city.

- To give a priority to the completion of a mass transit system based on the network of underground and streetcar lines with a supporting system of bus lines,

- The Prague subway system is to be represented in a final stage proposed in the Master Plan as a radial scheme of 4 principal subway lines. Subway lines are usually branched into 2 or 3 lines within the territories of
suburbs. After completion the subway network will have a total operational length of 93.5 km (58 miles) with 103 stops and stations. Street car systems will utilize selected existing lines that cross the city in tangential lines touching the CBD area. Some of these lines serving new areas with a high number of inhabitants will be operated by light rapid transit (fast street cars). Medium size buses running on electric power will serve those inner city areas which will not be sufficiently covered by underground or streetcar transportation. Classical bus routes will predominate in circular lines within the territory of the outer city.

The development of the subway is to take place in two phases. The first phase ending in 1986 will cover most frequented areas of the inner city. This will make possible a substantial reduction of surface transit now represented by bus and street car lines. The second phase ending in the year 2010 will gradually connect Prague's CBD with the longest residential areas and principal city centers located in outer city territory. Remaining densely populated housing estates will be served by rail rapid systems using longitudinally, physically separated lines.

It is assumed that city mass transit will serve 1,720,000 of the 2,520,000 passengers traveling within the city each day.

- To gradually develop the network of city expressways with necessary supporting facilities,

  The final planned shape of the expressway highway system depicts a network of radial highways linked with two circular expressways. This basic system will be formed within the territory of Prague City with the exception of Prague's inner city. The inner city territory is deliberately protected against expressway transportation and will be served by a pattern of existing
the thoroughfares that will be gradually reconstructed and interconnected with the expressway system

- To proportionally reduce individual transportation within the PHUR territory. The achievement of this objective is to be supported by relatively dense mass transportation that sufficiently covers the entirety of the protected territory. The reduction of individual transportation will be predominantly achieved by administrative restrictions upon transportation. In these areas, the network of streets for general use as well as the capacity of parking that is available for private transportation will be very limited. The majority of streets in the PHUR will be accessible only to area residents, service and emergency transportation. On the other hand areas adjacent to the PHUR as well as selected mass transit stops and stations will be gradually equipped with parking and garage facilities. These will make possible easy transfer between individual transportation and mass transit.

- To promote pedestrian transportation within areas with a high concentration of inhabitants,

This objective predominantly concerns all types of city centers. In the principal city centers such as the PHUR as well as some district and community centers, the pattern of purely pedestrian streets and other urban spaces has been designed and in some cases supplemented. These pedestrian systems are enhanced by appropriate facilities for shopping, services, culture as well as recreation. The proximity of mass transit stops and parking facilities is also a factor.

- To reduce long distance (intercity) transportation within the territory of the inner city,
This goal promotes the completion of the already undertaken reorganization within the system of inter-city bus terminals. When completed only the international and the most important lines connecting Prague with other larger cities will terminate near the CBD area. Other lines such as regional lines and remaining state transportation will end in those terminals spread in the suburbs. These terminals will be sufficiently equipped with mass transit lines.

- To create an integrated passenger and freight railroad system,

A radical rebuilding of the city railroad system, which will substantially simplify the existing network, is now under way. The final phase of this system projected in the Master Plan will consist of several freight depots spread in the outer city and several passenger stations with a principal railroad station located on the margin of CBD area. The freight depots will already developed and developing industrial parks as well as wholesale facilities within city suburbs. The principal passenger railroad station will serve the international and major industry connections while other stations will satisfy the needs for regional transit.

- To improve efficiency and to reduce freight transportation by truck within city limits,

This objective will be implemented through the development of an integrated pattern of wholesale facilities deliberately spread over the entire area of the city. Also the construction of unconventional delivery systems is to be provided. These systems, utilizing underground levels for automated freight services operated by computer, are especially advantageous in areas with a high volume of delivered goods, a strong density of population and lower environmental qualities. For the CBD area a unified underground service
system providing delivery as well as removal has been suggested and the first experimental segment of such a system is currently under study and being elaborated.
- To enhance the utilization of the Vltava river as a waterway for freight transportation,
  . In relation to this objective several river transportation facilities will be gradually built and rebuilt for the purpose of increasing river transportation and augmenting the load capacity of rivercraft.
- To promote the distribution of various communication systems such as video-telephones and cable or closed circuit TV systems,
  . The practical utilization of these systems is projected for the turn of the next century. It is also predicted that these systems would substantially reduce the amount of job related trips, university related trips, as well as some shopping trips.

(Objectives pertaining to utility services):
- To ensure sufficient supply of heat energy for the fulfillment of the stated environmental standards,
  . The implementation of this objective is based on the increasing utilization of domestic fuels as well as clean burning fuels for the production of heat. The efficiency of heat production and delivery will be enhanced by the rising use of heating units in dwellings and buildings as well as the use of power plants for central heating. A new policy for the production of heating energy has been proposed for the purpose of adhering to environmental standards. In 1990 the production of heat will be achieved through a combination of solid fuels (12%), liquid fuels (34%), and gaseous fuels (54%). This compares with a percentage of 89% for solid fuels,
5.5% for liquid fuels and 10.5% for gaseous fuels in 1970. Accordingly the structure of fuels used for heating is precisely specified for individual regions of the city. For example, the PHUR territory will be predominantly heated by electric power and the use of gaseous fuels, while heating energy for new housing projects in city suburbs will be generated by a combination of solid and gaseous fuels in central heating stations. Also, the heat produced as a by-product in nuclear power plants will be utilized to heat selected suburbs.

- To ensure a sufficient quantity of electric power,

Electric energy for Prague is obtained from city power plants as well as from an integrated state run electrical system. Electric power will be predominantly produced in nuclear plants as well as conventional power plants burning coal. The three nuclear power plants are projected at a near distance from Prague agglomeration. In the Master Plan the consumption of electric power is projected as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>1980</th>
<th>1990</th>
<th>2000</th>
<th>2010 kWh/inh/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>830</td>
<td>1350</td>
<td>2000</td>
<td>2850</td>
</tr>
</tbody>
</table>

- To ensure sufficient quality and quantity in what concerns water supply,

After the recent construction of a new sizeable water reservoir behind the boundary of the Prague agglomeration, a sufficient water supply has been ensured for several years into the future. Additional water resources will be obtained from reservoirs designed behind the boundary of Prague City as well as by the increasing utilization of Vltava river water treated in reconstructed and newly built water purification plants.
- To increase the capacity of liquid waste collection and removal systems as well as to increase the capacity and quality of liquid waste treatment processes,

. At present the city sewage system is being fundamentally reconstructed and expanded. When completely implemented, this system will cover city demands as well as providing a required reserve capacity. As the capacity of the existing central treatment plant in the city will be completely exhausted in the years to come the construction of a new central sewage treatment plant having high capacity is projected for allocation behind the boundary of Prague's agglomeration. Existing sewage treatment facilities will use as a sewage pre-treatment process and as pre-pump station for the above mentioned plant.

- To enhance the periodic collection and removal of solid wastes. To enhance recycling and waste conversion methods within complex waste disposal processes,

. For waste material recycling, a network consisting of predominantly existing collecting centers is being envisaged. Some of the largest collection centers for selected domestic as well as employment related wastes will be reconstructed and equipped with new technological facilities improving operational efficiency.

The number of incinerators fitted with equipment for the generation of heat will be substantially increased. It is assumed that pyrolysis technology, as an optimal method of waste conversion (thermal decomposition of waste), will be utilized on a wider scale after the year 1990. New landfills will be located behind city boundaries.
- The promotion and the construction of collectors for utility service
  lines
  By Czechoslovak standards the collectors consist of tunnels lined near
  the surface and having a relatively small cross section. Collectors consist
  of one or two separated spaces currently containing all utility service
  lines. Collectors will be usually constructed in newly built or renovated
  areas. In the territories where underground freight and post delivery
  systems are to be developed collectors for utility service lines will
  become integral components of those facilities.
5. A comparison of physical planning for Baltimore City and Prague City

The last chapter of this study is devoted to a brief comparison in selected fields of physical planning for both cities. Some consideration pertaining to the general approach to American physical planning will also be mentioned. This comparison and those considerations would have to be accepted as the independent opinion of a European architect although they may not be fully objective in view of these limitations.

The comparison is focused upon characteristic elements pertinent to the cities and upon substantial differences in three basic areas including the contemporary situation, the physical planning process and the principal objectives and policies of comprehensive planning documents.

First I would like to review some figures and trends in the contemporary physical state of Baltimore City.

1. Baltimore city covers an area of 79 square miles with 783,320 inhabitants (Census statistics 1980). The city area represents only the urbanized core of the Baltimore metropolitan (urbanized) area and is considerably built up. Therefore, it practically has no vacant territories for extensive physical development. The physical development of the city is dependent upon the renewal or reconstruction of existing structures or must be implemented within the territory of the Baltimore Standard Metropolitan Statistical area (SMSA). The Baltimore SMSA consisting of Baltimore City and five surrounding counties occupies an area of 2259 square miles with 2,164,930 inhabitants.

2. Baltimore City faces a significant population decline that has accelerated over the last several years. On the other hand the population of the SMSA
has naturally increased as depicted by the following figures:

<table>
<thead>
<tr>
<th>Year</th>
<th>Baltimore City</th>
<th>Baltimore SMSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>949,708</td>
<td>1,457,781</td>
</tr>
<tr>
<td>1960</td>
<td>939,024</td>
<td>1,803,745</td>
</tr>
<tr>
<td>1970</td>
<td>905,787</td>
<td>2,071,016</td>
</tr>
<tr>
<td>1980</td>
<td>783,320</td>
<td>2,164,430</td>
</tr>
</tbody>
</table>

This is accompanied by a continuous decrease in the proportion of whites within a total population of the city.

In Prague, such disadvantageous depopulation in an area has been the case in the relatively small territory of the PHUR and has been slowed down in recent years. This was achieved by improvements in housing policy and the reduction of employment facilities located within this territory.

3. The labor force in Baltimore City represents 524,400 individuals and unemployment for 1978 stood at an average annual rate of 7.3% of the total labor potential. In the year 1980, the labor force could be broken up as follows:

<table>
<thead>
<tr>
<th>Industry</th>
<th>Thousands of employees</th>
<th>Percentage of total employment</th>
<th>Average Annual growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. manufacturing</td>
<td>80.6</td>
<td>15.4</td>
<td>-2.4</td>
</tr>
<tr>
<td>2. contract construction</td>
<td>21.9</td>
<td>4.2</td>
<td>-1.9</td>
</tr>
<tr>
<td>3. transportation, communication, public utility</td>
<td>39.8</td>
<td>7.6</td>
<td>-1.2</td>
</tr>
<tr>
<td>4. trade</td>
<td>115.6</td>
<td>22.0</td>
<td>-0.4</td>
</tr>
<tr>
<td>5. finance, insurance and real estate</td>
<td>39.7</td>
<td>7.6</td>
<td>+0.7</td>
</tr>
<tr>
<td>6. services</td>
<td>141.9</td>
<td>27.1</td>
<td>+2.0</td>
</tr>
<tr>
<td>7. civilian government</td>
<td>84.7</td>
<td>16.2</td>
<td>+2.3</td>
</tr>
<tr>
<td>Total</td>
<td>524.900</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
In manufacturing, the food and production, the primary metal industry, publishing and related industries as well as the transportation equipment industry prevail. In other fields, professional services (such as medical and other health services, legal services, educational and miscellaneous services), retail trade, as well as state and local government dominate.

4. Demographically, Baltimore City has a disproportionately large population of individuals who are at or above age 65. This age group represents 11% of the city's population while being equivalent to only 7.5% of Baltimore County's population. Prague shows a similar trend in this respect.

In comparison to surrounding counties, Baltimore has the lowest percentage of individuals who have obtained the highest levels of education.

A comparison of 1978 Effective Buying Income (EBI) in Baltimore, Maryland and in the U.S.A. is depicted by the following chart:

<table>
<thead>
<tr>
<th></th>
<th>Baltimore City</th>
<th>Maryland</th>
<th>U.S.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBI Average Household</td>
<td>$15,032</td>
<td>$19,851</td>
<td>$18,722</td>
</tr>
<tr>
<td>EBI per capita</td>
<td>$ 5,389</td>
<td>$ 6,734</td>
<td>$ 6,552</td>
</tr>
</tbody>
</table>

This distribution of EBI indicates that nearly 19% of households have an income of less than $5,000 per year while more than 13% of households have incomes over $25,000 per year.

5. The physical structure of the city can be briefly described through a discussion of land use patterns, spatial composition, physical conditions of city structures as well as the centralization and the development processes.

Land use structure involving city centers, institutional facilities, industrial facilities, housing, recreational facilities as well as transportation and utility services, will be analyzed.
City centers are represented by a principal city and metropolitan center (Metro Center), one regional center, several lesser multiservice centers and a higher number of specialized professional service facilities spread predominantly within the inner city area. The majority of institutional facilities as well as commercial and business facilities are concentrated in the Metro Center or in surrounding areas. Industrial facilities are located along an extensive city harbor, advantageously utilized harbor facilities and a huge concentration of other transportation structures such as the railway and road network.

Housing is spread over the entire territory of the city. The majority of residential areas are composed of family row houses arranged in blocks. The average height of each dwelling structure is 3 stories. In out city the proportion of residential areas consisting of detached single family houses increases. Residential densities vary from 50-150 inhabitants per acre in residential areas in the core of the inner city to 25-50 inhabitants per acre in the inner city. The figure drops to a maximum of 25 inhabitants per acre in the outer city. Total housing stock was estimated at 302,680 housing units. Of these nearly 80,000 units are considered to be of substandard overall quality. Most of these units are located in the inner city where they represent more than 30% of total stock.

The contemporary structure of existing residential housing is represented by the following figures:

<table>
<thead>
<tr>
<th>Housing units located:</th>
<th>number:</th>
<th>%:</th>
</tr>
</thead>
<tbody>
<tr>
<td>in single family structures</td>
<td>212,108</td>
<td>70.1</td>
</tr>
<tr>
<td>in multifamily structures</td>
<td>90,572</td>
<td>29.9</td>
</tr>
</tbody>
</table>
Average area per inhabitant in housing units is estimated at 288 square feet. This compares with 167 square feet per person in Prague.

In 1976, new housing production within the Baltimore region represented the construction of 11,783 multifamily housing units and 3,119 single family housing units.

Recreational facilities represent a relatively dense network of various field houses, recreation centers, playgrounds, playfields and swimming pools that are more densely concentrated within the circle surrounding the CBD area. Recreational facilities of metropolitan and state significance such as museums, civic centers, theatres and galleries are predominantly concentrated in the inner city of Baltimore City.

Large open spaces with parks are mainly located in the outer city area. The total area of public parks and recreational lands attains 5,800 acres and thus corresponds to an average area 35.8 square yards per inhabitant. This compares to 59.8 sq. yds. per individual in Prague.

While individual transportation maintains priority in the city's transportation resources, mass transit organized in the shape of a relatively dense network is increasing in importance. The proportions of work trips in 1977 in the Baltimore region utilizing mass transit and individual transportation are expressed by the following figures:

<table>
<thead>
<tr>
<th>Mode type</th>
<th>Total in survey:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Auto driver</td>
<td>727,100</td>
</tr>
<tr>
<td>Auto passenger</td>
<td>141,100</td>
</tr>
<tr>
<td>Mass transit</td>
<td>111,500</td>
</tr>
<tr>
<td>Taxi</td>
<td>2,700</td>
</tr>
<tr>
<td>others</td>
<td>9,600</td>
</tr>
</tbody>
</table>
The road system is formed of a dense network of major and urban thoroughfares as well as radial segments of expressways. The city expressway system has not yet been completed. Buses are operated in radial and tangential lines connecting Baltimore's suburbs (in surrounding counties) with the CBD area. Purely pedestrian streets are restricted to short segments in the CBD area and in recreational spaces.

In the field of utility services, fuels used for the production of heat and electricity substantially differ from those used for this purpose in Prague. Production in the Baltimore region is generated by the utilization of non-polluting fuels involving residual oils, natural gas and nuclear energy. This substantially contributes to relatively high air quality as well as overall cleanliness. On the other hand, environmental conditions along principal city thoroughfares are considerably damaged by high noise pollution generated by dense individual transportation and buses.

The spatial composition of Baltimore City logically represents the image of an "old city" on the eastern American coast. The downtown area is composed of tall non-residential buildings and skyscrapers that are gradually replacing former low density and residential structures built up in the second half of the 18th and the first half of the 19th century. This city core depicts constructions of various architectural qualities implemented in the period since the beginning of this century. Such CBD area have high employment densities and create the characteristic silhouette of Baltimore as well as many American cities. Areas surrounding the hub of Baltimore City predominantly represent residential row house structures built up in the
turn of the 19th century and usually having a height of 3 stories. The outer city area is mainly formed of low density residential areas consisting of row housing and detached single family houses, having usually a height of 2 stories. This part of the city was constructed after the year 1915. The structures of the inner city as well as outer city are occasionally diversified by multistoried residential and institutional buildings.

The terrain of Baltimore city is relatively flat and dotted by several shallow valleys with streams penetrating the outer city. In some of these valleys the natural landscape has been preserved and improves the general appearance of the city environment. The Chesapeake Bay with its inner harbor and with Federal Hill park expressively contributes to the spatial composition of the CBD area. Fort McHenry and several protected historic buildings complete from a cultural as well as city development standpoint the atmosphere of the city.

Several years ago the complex revitalization of the Metro Center and Inner Harbor began and at the contemporary state appears to be an exceptional and vastly successful city center renewal. Also the reconstruction of several selected original residential areas within the inner city were implemented with federal and state grants. Nevertheless, several other housing areas in the city are in critical physical condition and deserve reconstruction or renovation.

In what concerns the organization of the physical planning process, the comparison will be focused upon the municipal organization as it is involved in the process of contemporary physical planning. The basic structure of the physical planning process as well as several types of principal planning
documents and city development materials.

The Department of Planning is a Baltimore municipal authority having full power to formulate, review, propose and amend as well as keep up to date plans generally showing the proposed physical development of Baltimore City. Physical plans are investigated, studied and adopted by the Planning Commission which is at the head of the Department of Planning. The Planning Commission consists of three higher municipal officers and 6 individuals who are residents of the city.

In Prague physical plans are adopted at the highest municipal level by the Council of the Prague City National Committee with a personnel structure similar to the Baltimore Planning Commission.

In the Baltimore City Charter Provisions for Planning (Article VII - Department of Planning) only the Master Plan and Official Development Plans are cited as principal physical planning documents. The Master Plan is described as follows:

"The Master Plan for the proposed physical development of Baltimore City shall consist of maps, plats, charts and such descriptive matter as may be necessary to depict the said Plan, and it shall show generally the proposed physical development of said city, and each map, plat or chart or other descriptive matter shall show one or more elements of the Plan. These maps, plats and charts and descriptive matter shall indicate the plan for the proposed physical development of Baltimore City, and shall show, among other things, the future general location and extent of all public improvements and enterprises, including among other things, the general location and extent of streets, highways, boulevards, viaducts, bridges, subways, tunnels and all uses of land for purposes of public transportation, and also the general location and
extent of piers, wharves, docks and bulkheads, and buildings or structures thereon, whether publicly or privately owned or operated, and also the general location and extent of publicly owned places of recreation, such as playgrounds, squares, and parks, and all public buildings and other public property, including school buildings, and all existing and proposed zoning areas or districts, and all public utilities, services and terminals, such as water, gas, electricity, sewerage, telephone, telegraph and transportation, whether privately or publicly owned or operated."

As stated, the Master Plan is empowered with the relevant planning authority in what concerns the interests of the public sector only, and it's stipulations pertaining to the private sector remain at the level of recommendations. Therefore the overall value of such a Master Plan is substantially restricted.

The structure of planning process for Baltimore is shown in the following simplified chart:
This process is very similar to the one used for Prague. The planning process for Prague contains in addition, a synthesis of the objectives proposed for the city at higher levels of the physical plan such as the state or federal development plan. This complex hierarchy of physical plans, beginning with the national development plan proceeding through individual regional plans and ending with the city or town plans, makes possible the optimal utilization of existing intellectual and material potential as well as the assessment of prospective possibilities in individual territories within the county from an overall national viewpoint.

An important factor in the quality of comprehensive physical planning is the sophistication of computerized information systems. At the present the Baltimore information system represents an initial stage in the formation of a data base. The data base is developed by using selected information from U.S. Census statistics supplemented by processed information obtained from various urban related surveys and studies. The Baltimore city computerized data base in current use for planning purposes contains the following information:

- land use structure (containing owner, address, size, approximate acreage, land and improvement assessment, zoning characteristics and land use)
- capacity and conditions of sewer system
- capacity and conditions of water system
- capacity and conditions of streets and roads
- park conditions and inventory
- flood warning system

Baltimore city does not have an elaborated Master Plan. The City Master Plan is substituted for Baltimore's Development Program and several additional physical planning documents such as the not yet completed Comprehensive
Plan, the General Development Program for the Baltimore Region, Population and Employment Projections for the period 1975-1990 as well as a number of other plans are also used.

Baltimore's Development Program, finished and adopted in 1976, consists of two principal components. The first deals with the specification of policies, programs, approaches and issues for long-range city development while the second document (the Capital Improvement Program) summarizes the major capital improvements planned for the period 1981-1986. This short-range plan has been revised and adopted in 1980.

Baltimore's Development Program specifically discussed:

- Comprehensive Plan goals and policies that are being furthered by the Capital Improvement Program;
- Strategies, approaches, and programs the City is pursuing;
- Recent accomplishments - projects that have been undertaken during the past six years to realize the goals and policies;
- Proposed projects - those scheduled for implementation during the next six years;
- Others involved in decisions and funding - agencies and programs affecting the City's efforts to realize the goals and policies; and
- Outstanding issues and future directions.

Thirteen areas of activity are treated in this report: multiservice centers, economic development, public safety facilities, education facilities, library facilities, recreation and parks, transportation, solid waste disposal system, storm water management system, waste water treatment system, water supply system, housing and community development, and Metro Center.
The Baltimore Development Program including the Comprehensive Plan does not treat all important elements for complex and long range city development. This document only emphasizes land use structure and does not contain principal economic, socio-demographic, and environmental data comprising factors such as projected economic development, prospective employment structure, population projections, principles of spatial composition, the preservation of historic and other important structures, the production of environmental standards (noise levels) and other factors. Nevertheless both principal documents derive realistic long range as well as short range objective, policies and programs that can be achieved through the city's funding and implementation processes.

In comparison, the Master Plan for Prague has been elaborated in the complexity of contemporary knowledge in this field, as mentioned in previous chapters. On the other hand, the objectives and policies of the Master Plan at both the quantitative and qualitative levels are deliberately specified in many cases for "one step" beyond, what actual conditions make possible.
6. Notes

In this sense, environmental conditions are perceived as factors contributing to complex environmental systems. This system consists of three principal components - society, material and non-material components that are man-made, and elements of natural origin. The system also includes linkages and internal relations between those components as depicted in the following diagram:

[Diagram showing the relationship between natural, artificial, and societal components]

---

*1 *
Relation 1 represents the enhancement or decline of the natural environment resulting from the existence and activities of society. This can lead to the stabilization or destabilization of the entire ecological system. This relationship usually affects all factors of the natural environment that are in turn perceived and adopted by society as components of the overall human habitat. Nevertheless, the management of society in the modern era implies the exertion of qualitative as well as quantitative influences on a majority of biological resources. These resources include forests, raw materials, crops, water as well as the climate. Influences upon these resources may bring about a decline in aesthetic qualities as well as biological qualities.

Relation 2 expresses the influence of natural environmental factors on society which can result in a positive or negative impact upon society. The influence of the natural environment is primarily evident in the following spheres and activities:

- aesthetic and psychological spheres
- biological and ecological spheres,
- material-economic spheres (such as the sources of natural materials - agricultural products and energy),
- natural hazards and other activities

Relation 3 represents the creation of a wide range of human production such as artificial components of the environment including settlement units, manufacturing and service units, operational systems and technology as well as various kinds of goods. The majority of these artificial components participate substantially in the formation of the complex human physical environment.
Relation 4 expresses the reverse effects on society of man-made elements in the environment. These effects can be felt in the material as well as intellectual areas. The sphere of social environment, in which elements as life styles and standard of living are classified, is predominantly influenced by the quality and quantity of elements that are of man-made origin. The possibility of technical hazards facing human society can be considered as a negative factor within this relation.

Relation 5 represents mainly the supply of raw materials and energy for the manufacturing of artificial products in reply to social demands.

Interrelation 6 represents social relations between inhabitants of particular urban societies. These comprise the linkages among various social, professional and age groups as well as relations between inhabitants and visitors. These internal relations are used to be searched in purely social spheres as well.

Interrelation 7 expresses relations resulting from the operational processes of the settlements - production, services and technical infrastructure (consisting of transportation and utility services). These relations are predominantly included within the independent economic sphere.

Relation 7 and 5 together contribute substantially to the formation of land use structures and physical linkages (technical infrastructure).

Interrelation 8 represents internal relations taking place within the scope of component of natural origin and expresses purely ecological linkages that are only rarely found in original state within urbanized areas.
These general goals and policies are clearly specified in approved and adopted planning documents at the federal or state level and the implementation of these depends on conditions within individual administrative territories. These objectives and policies express social and socio-technical principles adopted and valid for a certain period in the fields of housing, education, working conditions, medical care, recreation, culture as well as personal, family and retirement benefits.
THE SPONSORS OF CONDOMINIUMS IN LARGE U.S. CITIES

BY

Jan van Weesep

Junior Fellow
Spring 1980

Center for Metropolitan Planning and Research
The Johns Hopkins University

May 1981
ABSTRACT

Many large cities in the U.S. have witnessed a proliferation of condominiums since 1970. At first, the condominiums were predominantly newly constructed, but subsequently most additions to the condominium stock were converted from existing rental units. The condos vary according to type of structure, location within the metropolitan area, price, and submarket. They have been promoted under changing housing market conditions, and have been influenced by a variety of changing external factors.

This paper explores the emergence of the condominiums in large U.S. cities and notes their varying characteristics. Subsequently, my argument for the study of the sponsors of the condominiums is presented. Based on a number of in-depth interviews with developers, real-estate consultants, and financiers, the background of the decision making process of the sponsors is sketched. Finally, a few possible effects of the emergence of the condominiums for the social structure of the urban area are discussed.

An excerpt from this paper was presented to the Urban Studies Section of the annual meeting of the Western Social Science Association in San Diego, California, April 23-25, 1981.
Introduction

Condominiums are a relatively new phenomenon in the housing markets of large U.S. cities. As recently as 1970, the entire stock of primary-residence condos in the U.S. amounted to only 60,000 units, and these were strongly concentrated in only a few locations. But since 1970 the production of condos soared: in 1975 the stock was estimated to number 1.25 million units; the 1980 Census of Population and Housing will likely register over two million units; and in a recent report, the Department of Housing and Urban Development predicted that the total number of condominiums may very well amount to over three million by 1985.

These numbers in themselves, although testifying to a phenomenal increase, do not make the condominiums of great importance to the study of the urban housing markets in the U.S. Even if three million units would be in existence by 1985, the condos would still account for only approximately five percent of the total housing stock. More interesting than the increasing number of units, however, is the relative concentration of the condos in a limited - but expanding - number of housing markets and the changing spatial distribution of the condos. Furthermore, the recent proliferation of the condos and their rapidly increasing share in recent completions imply that they constitute a rapidly increasing share of all units currently available to home-buying households. An additional reason to study the condominiums in their effect on other housing submarkets; this effect has become of prime concern since the majority of new condos now result from the conversion of
existing rental housing, which has helped to worsen the rental housing crisis.

The introduction and proliferation of condominiums have been accompanied by an increasingly heated public debate on alleged advantages and disadvantages of the condos. To some, the condos provide new opportunities for home-ownership at a time when single-family homes are priced beyond the means of the average household and in locations where no other types of home-ownership units could be provided. Such supporters of the condominiums frequently point out that this type of housing can thus aid the ailing central cities: by attracting new investment, by preventing further flight to the suburbs, and even by stimulating the return of suburbanites to the city. To others, the condos signify a threat to stable communities by eroding the rental market. These opponents generally demand more government intervention to protect the population that is being displaced and to save the remaining rental housing from extinction. They see such government regulation as the only alternative to an otherwise unavoidable expansion of government involvement in the provision and maintenance of housing.

The study of condominiums must incorporate the wide range of aspects characteristic of this form of housing and of its impacts. In this paper, however, a limited perspective will be taken; other aspects will be studied in subsequent papers. After a brief review of some of the varying and changing characteristics of the condominium structures with respect to location, structure types, price, and market position, the discussion will focus on the sponsors of the condominiums. At first, I
will present my arguments for studying the supply side of the housing market. I will subsequently outline the role of the condominium developer, the options he has, and the conditions that influence his choice of option. Finally, I will make some tentative observations on the probable impact of the condominiums on the changing social structure of metropolitan areas.

**Changing Characteristics of the Condominiums**

The 60,000 primary-residence condominium units that existed in 1970 were concentrated in only a few SMSA's; SMSA locations accounted for 92% of all units. Most condos were concentrated in the South and West, where they were to be found predominantly in retirement communities. In several SMSA's - such as Fort Lauderdale/Hollywood and West Palm Beach in Florida, and Anaheim/Santa Ana/Garden Grove in California - they accounted for five percent or more of the total housing stock. At the time most condominiums were part of townhouse complexes, with only 35% in multi-family structures. High-rise structures accounted for only 13.4% of all condominiums. The majority of the condos were inexpensive, according to a limited survey: 48.7% were offered for sale at a price between $20,000 and $35,000, and an additional 15% of the units were priced below $20,000.

Between 1970 and 1975 over a million new units were constructed. The production clearly accelerated until 1973, but the ensuing economic recession of 1973/74 diminished the number of housing starts in general and also negatively affected the construction of condominium projects.
In 1974, the production dropped by 100,000 units below the 318,000 units constructed in the previous year; in 1975, only 40,000 units were completed. Even though the production of new condominiums rebounded somewhat around 1977 (production: 150,000 units), the record outputs of the early years of the seventies was not matched in a single year during the second half of the decade.\(^5\) Overproduction in the early years of the decade, sharp increases in construction costs, increasing government controls, and a very tight housing market which rapidly inflated housing prices are generally considered to be the dominant factors in moving the newly constructed condominiums out of reach of most first-time homebuyers and retired people on fixed incomes.

While the condominium starts in new construction projects showed a marked decline, the conversion of rental units to condos gained momentum. Between 1970 and 1975 only approximately 85,000 conversions took place, but in 1976 20,000 units were converted, and from then on the number grew rapidly. Both in 1979 and 1980, 145,000 units were reportedly converted.\(^6\) The rapid proliferation increased the overall market segment of the condos, but of far greater importance was the altered spatial distribution of the condos. While most condos are still to be found within (the largest) SMSA's, they are no longer restricted to those of the South and West: all now have significant numbers of condos, both in their central city areas and in the suburban zones. The conversion phenomenon, especially, has reinforced the concentration in urban areas, since structures and complexes suitable for conversion are mostly confined to such areas. An indication of the dispersion of condominiums to all major metropolitan areas can be found in the recent HUD study of the conversion of rental housing to
condominiums: the twelve most active SMSA's with regard to condominium conversions (which together account for 54% of all converted units) not only include areas that witnessed an early emergence of condos, such as Miami, Tampa, Los Angeles and San Francisco, but also SMSA's in other parts of the country: Boston, Chicago, Denver, Minneapolis, New York, Seattle, and Washington, D.C. In several of these cities practically all of the most desirable buildings have already been converted, and the conversion is currently spreading to smaller, older, and less expensive complexes that frequently need more rehabilitation. At the same time, developers who concentrate on rapid conversion of luxury buildings have shifted their activities to other cities.

Most condos are part of townhouse complexes or of garden apartment complexes. They are attractive to buyers for several reasons: their lower price when compared to single-family homes; the joint recreational facilities often included; more attractive designs and lay-out than in the standard subdivision; and finally, the transfer of maintenance responsibilities from the individual owner to the homeowners association. To sponsors, such complexes allow greater flexibility in development and thus carry less risk than high-rise complexes. The low percentage of high-rise complexes is also due to the fact that approximately 50% of all condos are found in suburban locations.

Also by price the condos are differentiated in a number of submarkets. A large proportion of condos is low to moderate in price, but examples of very expensive units abound. Recently constructed condos tend to be more expensive, due to the rapidly inflating construction costs. The number of expensive condos is further augmented by the conversions; at
first the most luxurious apartment buildings tend to be converted when developers move in on the conversion trend. But in general, the conversions are cheaper than newly constructed units, which has helped to keep the condos affordable.

Finally, in the characteristics of the occupants, the condos are distinguished in some respects from other housing: the elderly are clearly overrepresented (partly due to the large number of condos in retirement communities), and so are singles, newly started families, and 'empty-nesters'.

The condos still don't dominate the housing stock numerically. They constitute, however, a large share of the units offered for sale at any one time. In the early seventies they accounted for 15%-30% of all recently completed dwelling units, and this proportion was much higher in those market areas where they were concentrated. Toward the end of the seventies, the share of condominiums in private multi-family construction - without government subsidies - increased to above 50%. At the same time, the conversion of rental units increased dramatically. By 1980, 1.3% of all rental units in the U.S. was converted; the percentage was found to be 2.2% for the 37 largest SMSA's, and an impressive 2.7% for the twelve most active SMSA's combined. Individual large cities have, however, witnessed even higher conversion rates: HUD reported that in Washington, D.C. 8% of the rental stock has been converted, in Denver 7%, in Chicago 6.8% and in Houston 5.4%. Many smaller communities and specific areas within large cities have been plagued by even higher rates. The effects of this wholesale shift of units from one submarket to another has fueled the public debate, and prompts us to look at the production side of the housing market.
The Study of the Residential Development Process

To understand the changes in the character of residential areas and consequently in the social structure of cities, geographers have given attention to the functioning of housing markets. Housing markets tend to be complex, due to the combined characteristics of dwellings, locations, and households. Regularity is observed in that specific types of dwellings tend to dominate certain areas, and given types of households tend to occupy similar dwellings. Consequently, the introduction of a new form of housing in an area would affect its social composition. The most direct approach to account for changes in the housing market is practised in micro-level studies: such studies generally aim to identify the actors involved and account for their respective roles.

Classical economists tend to stress the demand side of markets. From this perspective, they might account for the increasing number of condos by emphasizing the increasing number of household formations; by observing that the post-war 'baby boom' has now reached prime home-buying age; by an increasing demand for tax-shelters because of inflating incomes; by noting that many people buy now - even at unreasonable costs - because of the fear that inflating prices will move the home ownership market out of reach within one or two years. The general decrease in family size, the increasing number of adult-only households, changes in lifestyle, and more emphasis on security promote the demand for apartments and units in fenced-in complexes.

Studies of the functioning of housing markets, however, have closely established that these factors in and by themselves cannot account for
the changes in the housing market. The consumers are compartmentalized in housing classes, groups with different positions in the housing market, determined by a system of formal and informal controls wielded by the various actors on the supply side of the market.\textsuperscript{10} Harvey's study of the role of financial institutions\textsuperscript{11} showed how owners, managers, and various agents utilize existing social and economic status stratification to allocate consumers to specific submarkets. Other researchers studied the production process of housing and focused on the analysis of the decisions underlying this process to account for the functioning of the housing market, its reinforcing mechanisms, and the vehicles for change.\textsuperscript{12} Their analyses are based on the observations that most housing units are speculatively built for the market, and thus, that housing consumers can only choose among the alternatives provided by the developers. The developers' decisions are guided by the profit motive and constrained by a number of limitations; consumer preferences are only taken into account if they are recognized by the developers and in as far as they run parallel to their interests.\textsuperscript{13} Therefore, a proper analysis of the supply of dwellings in a market economy requires an analysis of the decisions made by developers. Among the various actors on the supply side of the market, the developers take the central position, because it is their role to take the initiative: to initiate the production process and to bring the other actors together. Although many significant differences exist among the developers, as reflected in their activities, in essence their role in the supply process is similar, and this process can be described in a general format.
The Development Process

The developer formulates the project objectives, he combines the various production factors, manages the production process, and sells the product. His specific contributions to the production process are: an intimate knowledge of the market (actually of three markets, e.g., the housing market, the capital market, and the market of the (other) production factors); familiarity with regulations; access to other agents on the supply side; and a willingness to take risks. The other key actors (owners, financiers, builders, and consumers) have to take positive action for the development process to succeed. In addition, the production process is helped along and to a certain extent influenced by a medley of specialists and intermediaries (attorneys, accountants, consultants, architects, title searchers, realtors, appraisers, government officials, etc.). The fact that the production of dwellings is such a long, complex chain of decisions forms the basis for the important role of the developers as initiator and mediator.

In the initial stage of the production process a prediction has to be made of the demand for the dwellings the developer contemplates producing, or even of a number of alternative options. The prediction does not only require accurate knowledge of the consumer demand, but also a good assessment of the activities of the competition. The highly fragmented production of housing has frequently led to over production and, in general, to severe oscillation in output. In 1975, approximately 20% of the total condominium stock in the U.S. was unsold, the single most important reasons for the spectacular drop in condo starts in that
year! The percentage of unsold units fluctuated from one year to the next, and often even within shorter periods. HUD concluded that these fluctuations were supply related: producers in market areas with a stable output did not encounter substantial problems with unsold units, but producers in strongly fluctuating markets (e.g. Fort Lauderdale!) suffered major losses. By and large, the demand for condos increased steadily, yet was not able to absorb rapidly increasing rates of output. The observation made earlier that the production of newly built condos dropped significantly during the second half of the seventies does not contradict this: the decline is explained by the rapidly increasing construction costs (e.g. in Denver: average $12 per sq. ft. in 1970 to $26 per sq. ft. in 1980) and by the availability of the converted units at lower prices.

In reality, the developer does not sell to the consumer but to an investor, either a mortgage bank or an equity investor. The developer thus has to create a product that meets their (investment) requirements. Before the development can start, financing arrangements must be made. The commercial banks that provide the construction loans and other short-term loans require security in the form of escrow money, pre-sales commitments, refinancing contracts, or liens on property. Mortgage lenders are interested in long-term worth as a guarantee against having to foreclose on property with little resale value. Equity investors are primarily interested in rapid appreciation. By and large, once horizontal property acts had been adopted by the states upon the instigation of the real estate and construction industries, to provide the necessary legal protection, the condos have satisfied the requirements of all these lenders. Only during the period of overproduction in the early seventies
was the confidence temporarily shocked. The current high interest rates have also tended to make lenders more cautious, but developers with good personal contacts and a good track record have little difficulty in finding money - but they have to pay more for it. In fact, increasing interest rates have, to a certain extent, stimulated the production of condos, because they forced to market toward cheaper units which the consumers could still afford. Only when the mortgage interest rates reached 18% was the production of condos also negatively affected, and during 1980 many new projects (both construction and conversion) were temporarily halted.

The financial plan has to be adopted before the development can be carried out; the developer has to seek commitment from the investors. To get favorable terms for qualified buyers, the developer pays points to the bank; sometimes he takes back a mortgage himself, if buyers are finding it hard to meet downpayment requirements. While such actions on the part of the developer might promote sales and could lead to more advantageous tax-planning by spreading the income over a number of years, the developer runs a high risk of losing his money if the buyer defaults. Tax-planning, greater flexibility, and less dependency on expensive outside financing are also important in the choice of the type of project the developer anticipates. Such factors, along with greater market appeal and restrictions on high rise structures, explain the popularity of townhouse and garden-type apartments among condominium developers.

The conversion of rental housing to condominiums is a development process that is very similar to new construction; only the selection of the structure to be converted and the sales program differ. Initially,
the conversions were limited to prestigious buildings and to structures in higher status areas. Often such conversions have a captive market, since tenants can not easily find an equivalent substitute for their present residence. High-income households can afford to buy their units and often can reap significant tax benefits. Conversions provide outsiders with an opportunity to buy into attractive neighborhoods relatively cheaply. Such projects, however, have already become unavailable in those cities where the conversions were introduced early. Developers who specialize in rapid conversion of luxury apartment buildings have shifted their activities to other cities. Other developers working on a smaller scale and more involved in rehabilitation have concentrated on smaller, lower-priced complexes. Thus, conversions have spread to more cities and have been promoted in various parts of cities and suburbs.

Apart from location and prestige, the age of the building, its amenities and appliances, its construction quality (and consequently the rehabilitation and remodeling costs), and the unit-differentiation are influential to the decision whether or not to convert it. When the necessary outlays for rehabilitation and remodeling are high, it is less likely that the building will be converted early. The construction and engineering reports are major inputs for the feasibility study. This will be made at an early stage in the conversion process, generally after the developer buys an option on a particular building and before he will commit himself. Older buildings generally require a higher investment than newer buildings, but this need not deter the conversion if the higher costs are compensated for by a superior location. New
projects are often converted "as is"; this is facilitated by the fact that rental buildings are nowadays designed with eventual conversion in mind. The differentiation of units by size and number determines the best market: singles and beginning families tend to prefer small apartments, while empty-nesters look for units with at least two or three bedrooms. Finally, an analysis of the present tenant profile is of increasing importance, on the one hand to estimate the number of potential buyers, and on the other hand because an increasing number of local governments have adopted protective measures by which certain groups have to be offered relocation assistance, alternative housing, or life-long leases on their present units.

An important aspect of conversion is compliance with government regulations; an increasing number of states and local jurisdictions have adopted regulating mechanisms. Such protective and regulatory statutes vary strongly from place to place. All states have adopted procedures for conversion and for registering new or converted condominiums; approximately 50% of all states have passed additional legislation. Numerous municipalities and countries have elaborated upon these to protect the housing market in general or to give special protection to specific groups of renters. Developers who spread their activities into new market areas are therefore generally obliged to hire the services of local real estate attorneys or consultants.

Finally, the developer has to develop a sales strategy which will guarantee a successful sell-out of the units. The sales strategies differ depending on local market conditions (including local government regulation), the characteristics of the complex being converted, the tenant profile, and the characteristics of the developer. Yet, most
strategies aim at maximizing the sale to present tenants both to attain the desired quick turn-over and to comply with increasing government regulations. In addition, many lenders nowadays require a 60%-80% pre-sale rate as a guarantee for successful conversion. A carefully designed sales strategy can also benefit the converter through minimal vacancies due to short-term leases on unsold units, especially when little or no rehabilitation is necessary. Thus, the developer can obtain income to supplement expensive short-term financing. Tenant discounts are often used as a powerful sales argument. Sales are often promoted by an open and correct relationship with tenants, but other developers attempt to get the same results through misrepresentation, aggressive sales procedures, or even harassment.

The conversion generally brings the developers a substantial reward for his activities and an attractive return on his equity investment, if he contributed any funds at all. The recent HUD conversion study\(^\text{16}\) quotes several sources that mention an average gross profit of some 30%. This yield is much higher when not related to the purchase price (plus rehabilitation costs) but to the developer's investment. Reportedly, prices are generally set at such a level that renters in low and moderately priced units would pay prices $50-$100 per month more for the ownership costs of their units than they would previously pay in rent. In expensive buildings the monthly outlays often double. Private equity investors who speculate on rapid appreciation to make capital gains are generally willing to pay a price so high that a negative cash-flow of up to $100 per month results when they rent their unit on a short term lease.\(^\text{17}\)
In spite of the very attractive profits that can be made by converting a rental complex to condominiums, owners of (larger) rental properties have not tended to undertake the conversions themselves, either independently or a joint venture with a developer/converter. The major reason for this is to be found in the different tax rates on ordinary income and on capital gains. If an owner sells a structure in its entirety, then, irrespective of the intent of the purchaser, his profits will be taxed as capital gain. If, however, the owner would be involved in selling the individual units, the IRS would consider him to be a real estate dealer, and any profits from such activities would be taxable at the ordinary income tax rate.\(^{18}\) Even though new schemes are continuously attempted, including conversions by tenants, it seems that the developer/converter will continue to enjoy a beneficial position, as long as the external conditions that govern the market allow condos to remain feasible.

**Conditions that Stimulate Condos**

Since 1970, the housing supply in the United States has seen some significant changes due to variations in total output, in characteristics and mix of types of newly completed units, and because of a decrease in mobility toward the end of the decade, which brought fewer older dwellings onto the market. The total number of newly constructed dwelling units amounted to almost 18 million between 1970 and 1980; during the first six years of this period, more dwellings were produced than in any previous decade. In each one of the years 1971-1973, the output topped two million units, only to fall back to less than 1.2 million
units in the wake of the 1973/74 recession. Following an initial recovery, the production dropped once more toward the end of the decade, mainly because of cost increases in all production factors. The new residential developments tend to show a higher density than before, houses and lots are downsized in an effort to keep the costs down, and an increasing number of units are completed in multi-family structures. A decreasing percentage of these are built as private rental complexes without government subsidies. The production is kept up only because of expanding government outlays and because of condominiums.

A number of explanations have been advanced to account for these changes. The higher densities and the increasing proportion of multi-family units have been related to steep increases in land prices and construction costs, which inflate the cost of the standard single-family home. Between 1972 and 1976, land prices rose 13% per year; the annual construction cost increases amounted to 8%, and the price for the average new single-family home increased 12.5% per year. (The price of existing homes inflated annually at the rate of 9.3%.) Since 1976, these price increases have continued, fueled by an increasing inflation rate and interest rates that reached record highs. The increase of the cost of borrowed capital was certainly a major factor and one neither the housing industry nor the consumers were used to. Since the Second World War, the interest rates have tended to become higher, but very slowly. In 1963 the rate was 5.89%, in 1972 it stood at 7.6%, and in 1976 at 9%, but in 1980 the prime rate had moved to over 20%, and mortgage loans were offered at 18%. These interest increases
influenced the return on invested capital and the total construction costs. The construction costs have been forced up by increasing government regulation of the development process, which has extended the length of time between the first design and the completion of the structure, entailing interest loss. Construction costs have also been raised by front-loading more of the development costs. (Formerly the development was slowly brought up to normal standards during the period of occupancy, but increasingly it is required to have the development completed before the first inhabitants move in.) The average construction costs increased substantially; because of these increases, fewer families can afford to buy a new home as first-time buyers. The average family income has increased far more slowly than the cost of housing (between 1972 and 1976, only by an annual 7%), and thus, while in 1963 53% of American families could still afford to purchase a home (at ≤ 25% of the gross family income), this percentage had decreased to 41% in 1975 and has since dropped further. In the early seventies, two-thirds of the completed homes were bought by first-time buyers; by the end of the decade, only one-third of these homes went to this group.\(^\text{20}\)

Because of their higher density, their relatively small size, and the economies achieved by mass production and rational construction methods, the condos are cheap in comparison with the standard single-family homes. But recently, also their market has been eroded by price increases, which led to the relative decline in output of new condo units. Their price now compared unfavorably with the competing converted rental units.
The conversion of rental housing to condominiums has rapidly increased, not only as a reaction to the increasing construction costs of new construction, but also because of the predicament of the rental market. The annual production of privately financed rental units has decreased from an annual average of 478,000 units during the 1972-74 period to approximately 50,000 units in 1980. This production falls short of the demand by approximately 200,000 units annually. During the most recent years the stock of rental units has witnessed a decline of 20,000-50,000 units annually,\textsuperscript{21} because of conversion and abandonment.

The private rental market suffers from a number of difficulties. Most of the rental stock is old (41% was built before 1941) and in disrepair; this results in high maintenance costs if the manager/owner intends to maintain his possessions properly. The yields are generally (too) low but cannot be raised substantially, due to the low average income of the renters. (One third of all American families are renters. Their average family income amounted to $8,800 in 1977, which compares with an average family income for homeowners of $16,000. The gap between the incomes of the two groups is growing, partly because the renters include the hard-core poor and partly because anyone with an increasing income joins the ranks of the homeowners if at all possible.) The proportion of income spent on housing costs is high among the rental population: 30% of renting families pay over 35% of their before-tax income for rent, 48.7% pay more than the generally accepted maximum of 25%.\textsuperscript{22} The number of units subsidized through one of the various HUD programs increased rapidly. (The total number of subsidized housing
starts in multi-family structures in 1975 was approximately 50,000 units; both in 1979 and 1980, the number of subsidized housing starts was approximately 200,000. Due to a decreasing output of multi-family construction, this production represented a growing proportion, 46.5% and 66.7% respectively.\textsuperscript{23} But in spite of this increased government effort, the rental market diminished and the nationwide vacancy rate dropped to below 5% for the first time in 30 years; in many places the rate dropped significantly below this.

The main problem for the struggling rental market is the diminishing returns on invested capital, as costs increase much more rapidly than income. While rents increased on the average by 79% between 1970 and 1979, all expenses increased by an average of 123%, and energy costs more than quadrupled.\textsuperscript{24}

The increasing pressure on the rental market and the tendency of the rents to increase have contributed to the emergence of active and vocal renters' organizations, which organized rent strikes and exerted political pressure to have protective measures adopted. Rent control measures have been adopted by an increasing number of local jurisdictions; these regulations, or the threat thereof, have negatively affected the willingness of investors to put their money into rental housing.

A small or even a negative income is in itself no deterrent to investment in rental housing, as long as other potential income is available: loss compensation by other income (tax shelter) and/or an attractive capital gain at the end of the exploitation period. A favorable tax regime stimulated private investment in rental housing until the end of the sixties: accelerated depreciation allowances,
compensation of (artificial) losses by other income, and a low capital-gains tax rate (20%). The Tax Reform Act of 1969 and later changes in the tax regulations (1972, 1973 and 1976), however, decreased the market value of rental property, and subsequent studies of and proposals for additional tax changes further undermined the propensity to invest (Smith & Shulman, 1974; Tucker, 1977). The rapidly increasing interest rates after 1973 made the situation even worse, and for many owners it has become unattractive to keep their investment money tied up in rental housing, especially if and when major new investments are required for maintenance or rehabilitation.

The value of the rental project is determined by the amount of future income expected from this source, while the value of the condos is determined by the sale price of comparable units. As a rule of thumb, a complex can be sold to an investor for rental exploitation at the rate of six or seven times the annual gross rent, but it can be sold to someone who intends to convert the complex to condominiums at nine or ten times the annual rent.

The "condo fever" spread rapidly from a small number of very active market areas such as Boston, Chicago, Denver, Houston, Los Angeles, New York, San Francisco, and Washington, D.C., to an ever-increasing number of other places. Not only large cities, but also medium-sized and small urban places are now being affected. It is generally believed that condo conversions blossom in places with a tight rental housing market (few vacancies) and in places having a strong demand for homeownership but a short supply of affordable homes. Rapid price
increases could be one of the factors, because an increasing number of households will tend to climb on the bandwagon before the aspirered homeownership has moved out of reach. There is a positive correlation between conversion and a condition of low rental vacancy rate and high rent level. But the question of cause and effect is highly controversial. The viewpoints in this controversy strongly resemble the standpoints regarding the necessity of government control of the conversions: to some, the conversions provide homeownership opportunities for households hard hit by high rents and the shortage of rental units at comparable prices; to others, the correlation proves the effects of conversion on the functioning of the rental market.

The standpoints in the debate also depend on the priorities with regard to the functioning of the housing market in general, and on the viewpoints taken with respect to the solution of the urban problems. This has been concisely summed up by former HUD secretary Moon Landrieu in his testimony for the Senate Subcommittee on Housing:

"Conversions remove units from the rental market; yet ironically, by encouraging investment, conversion may be the best hope of preserving much of our existing housing stock. Conversions displace some lower income people, yet they also provide homeownership opportunities for others priced out of the single-family market. As conversions contribute to the problem of urban displacement and the lack of rental housing, so do they contribute to neighborhood revitalization and increase local tax revenues. Thus, conversions present a complex picture."

The Effects of Condominiums on the Social Structure of the Cities

When the condos were first introduced in the U.S., the promoters emphasized the possible contribution to retaining inhabitants in the city or attracting suburbanites back. The notion that the condos can aid
the ailing cities by attracting re-investment is still very much alive. Homeowners generally find themselves in a different stage of life and tend to enjoy higher incomes than renters. By virtue of the fact that condos are homeownership units, one may expect them to be inhabited by a specific selection of occupants; but the group is internally differentiated because different structures and different units - and other locations - attract different types of households.

Condominiums may be expected to influence the social structure of their neighborhoods strongly when they are of a different type than the surrounding buildings. The construction of low-rise apartment buildings in an area of predominantly single-family homes will certainly attract a different group of residents to the area. These owners would have more in common with other apartment dwellers; one would not expect large differences in family status, but both income position and age might be different. The impact of the condominiums on the social structure of an area can thus be related to a number of decisions on the part of the developer. The same is true for conversions; the selection of the project to be converted and the way this is brought about influence the proportion of the tenants that choose to buy their unit, and this strongly affects the impact of the conversion on the social structure of the area.

Empirical evidence to check these expectations, however, is scarce and in some ways contradictory. While the condos are expected to provide an anchor for the redevelopment of cities, the displacement resulting from conversion is often refuted. Recent studies have suggested that an increasing number of tenants buy their apartments, perhaps due to the
scarcity of alternative housing. Speculative investment keeps part of the units available as short-term rentals. But other studies quote very high displacement rates. Apparently local situations differ strongly. One of the problems of the blurred relationship of housing and household characteristics seems to be that the housing market in many areas has become so tight and insecure that the frequently observed correlations between dwelling types and household characteristics have been disrupted. Predictions as to the long term impact of the condominiums on the social structure of the cities are, therefore, highly uncertain.
Acknowledgments

This paper is an interim report of an on-going research project to study the condominiums in large U.S. cities. The project was initiated during my participation in the International Fellows Program of The Center for Metropolitan Planning and Research of The Johns Hopkins University in Baltimore, while I was on sabbatical leave from The Free University in Amsterdam, January-July 1980. Support from both these institutions, and from The Council for International Exchange of Scholars, Washington, D.C. is gratefully acknowledged.

The substance of this paper draws on a variety of published sources and in-depth interviews with representatives of developers, financiers, real estate consultants and attorneys, and policy makers. The interviews were used to check the observations on the condominiums derived from the many articles and notes in journals, newspapers, and newsletters of the various trade organizations. I would like to express my gratitude to those who made me aware of the various sources and above all to those who liberally donated their time to share their information and insights with me.

A complete list of sources and contacts will be provided in the final reports on this study.
NOTES


7. The Conversion of Rental Housing, op. cit., Table IV-2.


9. The Conversion of Rental Housing, op. cit., Appendix 1, Additional Tables.


14. This section of the paper is based on observations from a large number of journals and newsletters of the construction and real estate industries which have subsequently been verified by in-depth interviews.

15. HUD Condominium Cooperative Study, op. cit.

16. The Conversion of Rental Housing, op. cit.


19. Data derived from Bureau of The Census, Construction Reports, Series C20 (Housing Starts).

20. These figures were mentioned in a number of interviews with developers and consultants; some are confirmed in the Ninth Annual Report on the National Housing Goal, Message from the President of the United States, Washington, D.C., 1977, Table 6.


23. Data quoted by (former) HUD Secretary, Moon Landrieu in his testimony before The Senate Subcommittee on Housing, at their Hearing on Rental Housing (Rental Housing, op. cit., p. 3).
