

Why LRT Makes Sense in a Tight-Budget Economy

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This document considers the effects of changes in the economy on the role of light rail transit. Changes in the way the United States and Canada are likely to employ economic resources over the coming decade and ways in which societies will likely wish to see funds spent are examined. Expected changes in the nature of activities that generate wealth are reviewed, along with their implications about changes in transport demand. The characteristics of LRT are assessed against expected shifts in demand and investment priorities. Light rail seems an attractive investment in this decade, both because it fits the emerging criteria and because at this stage in its development its characteristics make it a low risk and indicate decreasing installation costs.

This paper is about strategy. It is also about synthesis. It examines the changing environment of transport investment and the changes in economic activity that underlie transport demand. It considers the attributes of a new—actually a "born again"—mode of transport and how these might be employed by sectors concerned with economic performance by drawing on knowledge of economic development, town planning, and public transport.

An examination of possible strategies can be a powerful aid to clear thinking about the opportunities and threats as well as the strengths and weaknesses of particular modes of transport and their relevance to future needs.

A broad, synthesizing approach permits consideration of a full set of influences on a particular sector or mode. Accurate information about a full range of variables—even if only within rather general orders of magnitude—is often more useful than complete, precise data on only one subsection of a problem. This is especially true when providing advice on matters of public policy.

Both approaches have their shortcomings, and before examining LRT and what it might accomplish now and in the future, it is best to define these. A strategy can provide a logical tale but is seldom the only possible assessment of information.

A synthesizing paper has as its principal drawback the fact that drawing together some common elements from disparate and complex fields requires substantial simplification. The exploration of caveats, side issues, and secondary interpretations must be left for another time. Furthermore, only enough supporting data can be shown to illustrate certain points. Otherwise, a presentation would result that would be too long and too complicated.

TRENDS IN THE ECONOMY

In North America the 1980s are proving to be a period when relatively more of our economic output is devoted to investment and less to personal consumption than in previous years. There are two important implications for public transportation: the emergence of major programs to rebuild public infrastructure and a fundamental shift in the economy away from traditional manufacturing.

This paper examines these changes and considers ways in which the low and decreasing cost of LRT and its high service and environmental quality can make investments in this mode of transport even more attractive than in the past.

The Shift From Consumption to Investment

As the economies of the United States and Canada grew during the 1960s and 1970s, there was also rapid growth in personal income and consumption. The outlook for the near- and medium-term future, however, is for a slower rate of growth in per capita income, in part because

economic resources are required to rebuild public infrastructure and to provide the necessary capital for a relative shift in income toward high-technology output.

A number of implications for public transport arise from a relative shift in emphasis in the economy. One is a swing in government funding programs toward greater use of available dollars for capital improvements rather than for operating expenses. Also, public expenditures to build up a nation's stock of capital goods and enable it to better generate income in the future are likely to be favored over those that relate solely to today's enjoyment. Finally, consumers will attempt to preserve current standards of living or increase them by having more than one household member work, by making do with currently held consumer durables, and by being more selective in overall expenditures.

Rebuilding Public Infrastructure

Just as corporations commonly provide direct capital goods for a particular enterprise, government generally provides underlying support for economic activity as a whole, be it sewers, roads, schools, or other services. Any given piece of this infrastructure will eventually require replacement, either because it becomes obsolete, is inadequate, or wears out.

In many parts of the United States and Canada there is a growing backlog of facilities that urgently need replacement and therefore jeopardize the ability of given communities to function properly. Broadly speaking, this situation might be the result of government priorities that lay elsewhere in recent years, or it might be the result of pricing policies that failed to charge users' fees high enough to provide a depreciation reserve and a return on capital.¹ Whatever the reason, the coming years will increasingly require investment in public infrastructure.

There is a tendency, when replacing worn-out or obsolete facilities, to assume that their underlying purpose remains unchanged and to concentrate on finding the best contemporary technical design. Whether new or changed demands have arisen since the facility under consideration was first put into use should be considered instead. In that way, the need to rejuvenate infrastructure not only benefits previous users but also opens up new possibilities.

Trends in Economic Development

Much research is being done in the western world in the area of economic futures. The purpose is to provide advice, for governments and others on the likely course of industrialized economies and the consequences of projected changes.^{2,3}

This section outlines expected changes in various economic sectors, since economic activity is a prime determinant of transport demand. Information about likely changes can indicate new opportunities and threats for public transportation. What follows is a fairly standard distillation of likely changes within selected, broad sectors. These are general trends only, drawn from "futures" work being done by Alberta Economic Development staff; all of the usual caveats about uncertainty, probable timing, etc., apply. This material, though tentative, does permit a better understanding of how demands for transport are likely to shift and which service characteristics are likely to command the greatest attention.

Traditional Manufacturing

Just as electro-mechanical technology replaced steam-mechanical and came to dominate factories in this century,

electronic devices and robots are now beginning to replace the electro-mechanical and are resulting in more robust industry. Two ramifications of this are worth noting: It permits much smaller scale manufacturing plants, and it results in an employment shift from the production line to design and maintenance of robots and similar equipment.

Resource-Based Industry

As their expectations and income rise, less developed countries seek higher prices for their raw materials. As a result, North America must search for indigenous resources through such means as enhanced recovery methods, the development of synthetic materials such as oil from tar sands, and the programming of substitutes such as coal for oil. Such activities involve a move to higher levels of technology and are incorporated in the material in following sections. The transport of resources is a major subject area and is beyond the scope of this paper.

Service Industry and High-Technology Goods

Developing countries require loans to buy the necessary infrastructure and other capital stock to bring themselves into the modern age. Servicing this debt requires a suitable cash flow and can be achieved only if the industrialized world buys goods from them. Their growing capability to produce manufactured items and their low labor costs combine to make the manufacture of traditional products (textiles, automobiles, etc.) increasingly attractive to the Third World.

The adoption of more advanced production methods in Canada and the United States will aid competitive performance, but we will likely see an intensification of the current shift to high-technology areas such as computers, communications, and life sciences.

Even more rapid growth can be expected in the associated software industry, i.e., research, design, application, marketing, and management activities. In this economy, information becomes the key, both as an input and an output element.

All of the above sectors show a shift toward high-technology production, goods, and/or services. Americans and Canadians increasingly will use products of high-technology plants, seek out goods of an advanced nature, and work in research, design, management, or some other service associated with these areas.⁴

DEMAND AND SITUATIONAL CONSEQUENCES FOR TRANSPORTATION

The consequences for transportation and the major locational factors for these new kinds of industry are discussed in the following sections.

Transport and Locational Elements

The term "high-technology goods and services" covers a wide field, as the preceding text indicates. Some important common elements are outlined below.

Freight Versus Passengers

The products of high-technology industries have a high-dollar value per pound, so the cost of freight is not the major determinant that it is in the resource sector. Therefore, from the standpoint of goods movement, such industries can locate virtually anywhere. Passenger transport, on the other hand, is at least as important to high-technology firms as other enterprises, and even more so for software organizations.

Contacts

The need for face-to-face contact with customers, firms, and people engaged in similar work, and with universities,

entrepreneurs, and suppliers of venture capital, is important to the operation of these industries.⁵ Although this need will decrease as communications improve, getting together with others is an essential part of the creative process on which this entire sector depends.

Setting

Although an attractive physical environment is desirable, the geographic location of raw materials and the need of traditional manufacturing plants to be close to final markets have posed constraints for many companies. Such limitations need not exist when freight costs are not a significant part of the final product price, and most high-technology groups are in attractive settings.

The small scale possible for such manufacturing plants means the firms need not service the entire continent, to be efficient. Regional industries may once again become feasible. By the same token, the old multi-story facility of the compact cities of the eastern seaboard can efficiently house high-technology industry—the sprawling, single-level plant on a multi-acre site in suburbia is no longer a necessity but an option.

Another aspect of setting is significant. In a compact city, where workers can walk to their jobs or public transit can be used, the cost of commuting will be less than long commutes by automobile. Cities with rail transit have about 30 percent fewer workers who commute by auto than do other cities.⁶ Since the cost of labor is a major input factor for industry, one way to control expenses in the future is to protect the labor element from such external shifts as the rapidly growing cost of automobile commuting by workers that is passed to the firm in the form of higher wage demands.

Requirements and Constraints

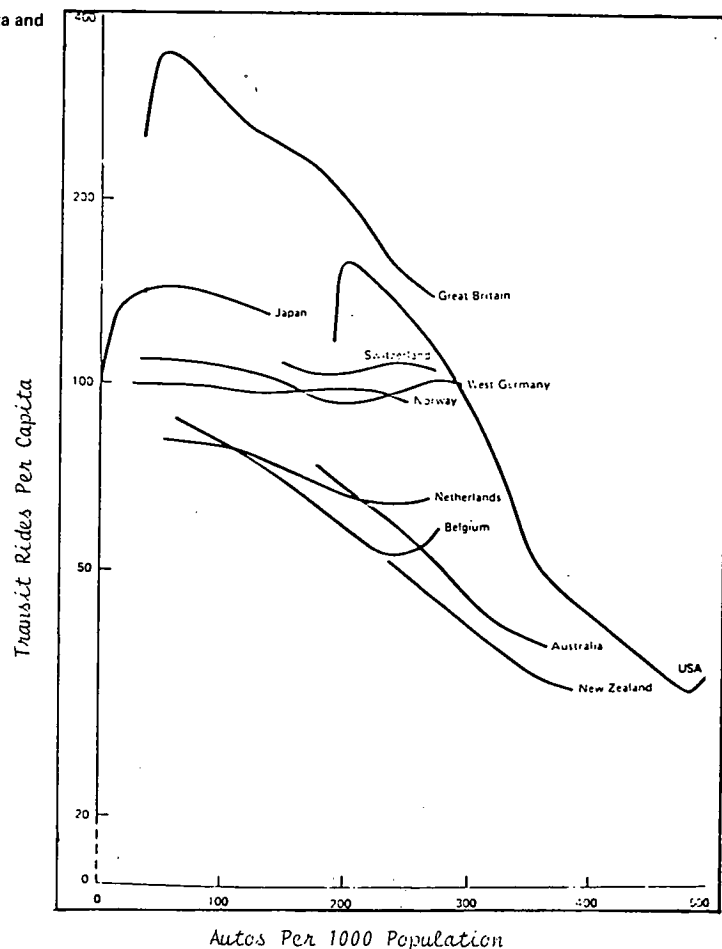
This paper set out to examine the infrastructure rebuilding question with emphasis on overall changes in the economy, to see if there were any changes that might indicate a different demand for transport infrastructure in the future. The points that reflect a likely future shift toward a high-technology and service-oriented economy and are closely related to transport issues are summarized below:

- Consumers will seek to protect their standard of living by seeking good substitutes for what they enjoy now. A good quality transit service will receive serious consideration by current car drivers.
- Government funding will likely emphasize capital spending more and operations less.
- Decisionmakers should seek joint uses in order to obtain more "bang for the buck" when rebuilding infrastructure.
- Intercity and urban passenger costs and quality will become more important due to a declining relative importance of freight costs.
- A greater need for face-to-face contact will appear.
- A quality environment will be important to cities seeking high-technology industry.

LRT AS AN INVESTMENT CANDIDATE

Important changes in the economy are developing that will affect the supply and demand factor of transport facilities and services. Before concluding that this indicates a major opportunity for the development of one form of public transport or another, the high level of auto ownership in the United States and Canada must be considered. A rational conclusion might suggest that people will choose competing goods or services according to price and perceived value, but the widespread possession of cars suggests that people will use them in preference to transit. This is not always the case. Figure 1 shows the relation-

Figure 1. Relationship between transit passenger rides per capita and level of auto ownership.



Source: The Demand for Public Transport. Report of the International Collaborative Study of the Factors Affecting Public Transport Patronage. United Kingdom Transport and Road Research Laboratory. Crawthorne, England. 1980.

ship between growth in car ownership and transit use in 10 countries. With the exception of the four English-speaking countries, transit riding in the western world held its own as automobile registrations climbed in countries usually associated with the aggressive development of high-quality public transport. The opposite has generally been the case with Britain, the United States, Australia, and New Zealand.⁷ This suggests that consumers do use public transport even in times of growing car ownership if the services offered are appropriate.

Attributes of LRT

LRT has been defined as "an urban transportation system that uses electrically powered rail cars operating singly or in short trains on fixed duorail guideways, may be grade separated, and loads passengers from low or medium height platforms."⁸ Not being a proprietary mode (like monorail systems), LRT exists in many forms and occupies a rather broad middle ground between bus and conventional rail transit. Its principal attributes as a mode are the following:

- It can bring a significant number of people together in a concentrated place.
- It can be built for much less cost than conventional rapid transit and still provide important operating savings compared to bus service.
- It can offer much of the service quality advantage

of conventional rapid transit, depending on the level of sophistication of infrastructure chosen (in-street trackage through to subway).

- It is environmentally "soft" (a busy place can be a nice place).
- It signals the permanence of service to the urban development industry by the permanence of its infrastructure (it can influence the shape of the community).

LRT can be built and used economically in low-density as well as high-density areas. Since its cost can be lower, it does not require the guaranteed high ridership needed by conventional rail transit in order to be justified. LRT excels in the following areas:

- It can link high- and low-density areas (whether homes with jobs or employers with market).
- It can provide circulation within either high- or low-density sectors.
- It can adjust the sophistication of the infrastructure as well as the extent of operations as the location, density, and ridership grow.

Matching LRT Attributes to Transport Requirements

Several cities have found the above attributes of LRT to be advantageous in their particular situation, and a number of new LRT systems have recently opened or are under

construction in North America. The demand characteristics of high-technology suggest an even greater potential for light rail in the future. Matching these demands to the salient product characteristics of LRT is considered in the following section.

Bringing People Together

Factory and retail employment has had a tendency to disperse since the end of World War II, but, unlike routine and humdrum work, creative work benefits from allowing people to meet face-to-face. Advances in communication will likely reduce such an advantage in the future, but, as does transportation, communication networks have hubs where people gather to digest and disseminate information.

Transit and downtown areas are complementary, and central business districts offer desirable locales for the software areas of high technology. Suburban sites are strong contenders for such industries, especially if adjacent to a major university. However, a suburban cluster can also be well served by LRT, especially since growing adoption of the Timed Transfer Focal Point approach to bus network layout (scheduled interconnection of several routes) can make such nodes attractive interfaces between rail and bus.⁹

Cost of Service and Transportation Productivity

Any form of public transport can bring people together at a given point, but LRT can do it for greater numbers and in greater comfort than a bus and without the high-capital cost of conventional heavy rail transit.¹⁰ LRT offers a balance that can be applied at moderate travel volumes and the kind of service quality that can attract motorists but does not require a major capital cost penalty. LRT is the only transit mode that shows a steadily declining real cost of installation, and light rail is midway between bus and heavy rail with respect to operating cost, meaning that investment can improve the productivity of transit labor.¹¹

Important economies can be achieved over a medium to long term by LRT if properly combined with urban development around stations. The productivity of light rail is not only evident in trade-offs between various transit options (bus, conventional rail) but also more fundamentally in the development of clusters of activity along a route that makes ridesharing among transit modes feasible by scheduled service and/or paratransit. The clusters also permit substitution of walking trips for vehicle trips. Corresponding economies apply to many services from mail delivery to repair services. The productivity advantage of LRT compared with buses is not as significant as the resource savings of polycentric cities (clusters) linked by a ridesharing system capable of handling high-peak loads.

Environment

The trolleybus is LRT's only equal in low levels of noise and fumes. Because LRT is built to be in scale with a streetscape, its physical presence need not be overwhelming, especially when a modest infrastructure has been selected.

But its environmental appeal goes beyond the relative absence of negative aspects: LRT is the only mode that the public regards as a positive addition to the landscape. Maclean's, Canada's national newsmagazine, described Calgary's recently opened downtown LRT transit mall this way: "Seventh Avenue has acquired a tidy, almost quaint continental ambience. Refurbished facades and the banning of car traffic have helped. But the sophistication is owed primarily to the city's silent new light rail vehicles built in Dusseldorf, West Germany."¹²

Seattle and Detroit also offer particularly striking examples of this sort. Both cities have recently installed, or are now installing, downtown streetcar lines—largely for the fun of it.

Developers know that a good urban building project is

greatly enhanced by a theme—by creating a certain atmosphere. LRT, quite apart from its transport element, can be used creatively to produce pleasing environments in which to live, shop, and work.

We are entering an era of greater emphasis on investment in capital goods, relative to personal consumption. Consumers want to preserve their present standard of living and seek good substitutes for expensive items. Governments want to shift funds from operating budgets into capital. LRT is attractive on all these counts.

Rebuilding and upgrading public infrastructure are key elements in improving a nation's productive capacity. Major transport investment presents important opportunities for light rail, since joint facilities can be more productive than single-purpose ones.

The nature of the North American economy is undergoing a basic change with a swing to high technology and service enterprises. This trend can be favorable for LRT if decisionmakers choose to accede to the demand implications inherent in such a trend.

LRT: The Declining Cost Curve

As attractive as light rail might be in light of the points presented above, any prospective use of public funds must be competed for aggressively in these tight budget times. LRT is a mode that was abandoned here for a generation and is now being relearned, partly from doing and partly from adapting practices from abroad for use in North America. We are, in effect, on the declining side of a learning curve, where successive applications can be more and more cost-effective. LRT thus stands out as the mode of transport with decreasing real costs of installation, and some of the reasons are discussed here.

Calgary, and shortly thereafter San Diego, broke a long-standing taboo in the North American traffic engineering world and opened LRT systems that use streetcar tracks for running through the downtown. Before this, new light rail systems were expected to use subways in central business districts—a far more expensive operation. The low-cost option of using existing tracks can also be considered for suburban territory, along with the use of abandoned or low-volume freight railway rights-of-way and the use of median strips of arterial roads.

Until recently all rail systems were expected to have fancy stations with tightly controlled "fare paid" areas and with ticketing handled by paid personnel or expensive, complicated machines. The adoption of self-service fares from Europe, first by Vancouver's Sea-Bus (waterborne rapid transit) and thereafter by Edmonton, Calgary, and San Diego LRT, permitted simple, unmanned stations without the cost of a driver on every car to collect fares.

Another important breakthrough came from Germany, where Linke-Hoffman-Busch (LHB) produced a diesel-electric LRT car, first for a suburban LRT line in Hamburg and more recently for an interurban service out of Graz, Austria. Similar to the cars operating in San Diego, Calgary, and Edmonton, the LHB units make it possible to build an LRT line without the expense of electrification. The cars are diesel-electric, which means that as traffic builds over time, overhead wires can be installed for all or part of a line without the need to acquire a new fleet.¹³

Some changes in traditional train control methods are opening up cost-saving opportunities. San Diego has developed an enhanced version of the normal railway block signal. Not a passive system, it includes a traffic control mechanism and makes red the normal aspect, not green. The British Columbia Railway, working with Glenayre Electronics and Transport Canada, is developing a new form of centralized traffic control—radio link control—that uses passive trackside transponders and a cab display as elements in a less costly form of train control.

These are measures that could be important to urban areas with moderate traffic volume and long travel distances, typical features of spread out, medium-sized U.S. and Canadian cities. Such low-cost measures are im-

portant not only in mature, established parts of these two countries but also in areas of rapid growth, where an expanding economy creates heavy demand for supporting public infrastructure and where several lines might have to be built at once.^{14,15}

LRT Investment and Risk Aversion

Any strategy has uncertainties. The timing and intensity of any aspect might prove different than anticipated; new elements might arise or circumstances may change; any one of a number of participants might rethink a decision. Prospects for LRT, by the assessment here or elsewhere, are no more immune from risk than are prospects for other possible transport programs. But light rail does have one advantage in this regard: the ability to be improved over time, while in service. LRT can be built now, using a minimum cost standard, and upgraded later if town development and traffic expectations are met.^{16,17}

If current passenger flow is too low or too uncertain to warrant immediate LRT construction, a right-of-way can be identified and protected against development, discontinuity through sale, and so forth. When roadways are rebuilt, structures and medians can be constructed to make future track installations possible without major expenditure.

When considering public investments, decisionmakers should be aware of the following light rail features that minimize risk:

- It can be built to the level of current need and upgraded only as and if needed.
- The system can be expanded incrementally; the initial start need not involve massive funds. Future dollars can be won by demonstration of its effectiveness.
- LRT is appropriate whether urban areas have relatively more dense and active cores or if a polynuclear form becomes increasingly dominant.^{18,19} Its design flexibility can accommodate a variety of growth patterns and can interlink a number of differing activity layouts.

SUMMARY

We are at an interesting threshold. There is a new emphasis on capital expenditure, a swing to a high-technology economy, and a consumer willingness to try substitutes. It is a time of rebuilding public infrastructure and cities and of building anew in fast-growth regions.

Light rail transit is coming of age at the right time. Its initial growing pangs are largely passed. It is on a decreasing cost curve. Its service characteristics match merging needs of Canadian and American economies.

Will it happen? Will the advantages seen in this paper for LRT be seized? They can, and will be, by decisionmakers who are encouraged to think in broad and strategic terms about urban and regional transport and who are presented with facts that demonstrate a useful range of modal choices for public investment.

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