Projections for Managed Growth Situations

'Why Don't They Teach Us About Declining Countries?'*

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Introduction

This article addresses an issue very much the central concern of all planners. The issue, however, has come into much sharper focus in the recent past due to the commencement of regional planning exercises all across Canada, sometimes in the form of Regional Plans, with either an implicit or an explicit objective of the 'management of growth.' The exercise is in many ways analogous to that of Master Plan preparation of the 1950's and the 1960's. Both involve relatively short term (five, ten, or fifteen year) prediction, projection, or the determination[1] of the spatial unit's future population size and composition and in terms of other related planning elements such as labor force, employment, housing, transportation, and hard services and soft services.

The contention of this article is that the context of the exercise is now quite different. The emphasis on the 'management' of growth, as opposed to that of the accommodation of growth calls for far more precise techniques of projection, or alternately of cybernetic determination, of both the size and the composition of future population and related factors. It is possible to rephrase the argument in language currently in vogue in planning circles: in a high-growth 'scenario' it is not necessary to be very accurate about the composition of future populations, indeed, not even about precise rates of growth. This is because very high error factors in growth projections can be tolerated when capital-intensive and technologically sophisticated corrective solutions are both feasible and acceptable. However, in a managed growth scenario the factors that come into play in determining the 'managed growth' are such that a much more careful anticipation of both the size and, crucially, the composition of future populations becomes important.

The remainder of this article elucidates the latter premise. The next section provides a catalog of the requirements that all projection techniques (primarily those of population) must satisfy in order that they be acceptable and usable. Many of these preconditions are self-evident, or at least widely understood. But others, related to the operation of the institutions that use projections, are not quite that obvious and are seldom taken into account by academic researchers who develop and perfect the techniques.

A brief description of the most commonly used groups of projection techniques follows. The current and evolving state of the art of projection preparation is then evaluated in the light of the principal concerns of 'growth management' and the methods suitable for growth projection in a managed context are outlined. The paper utilizes the experience primarily of the provinces of Ontario and British Columbia.[2]

Finally, critical demographic and economic factors are listed which until now have only interested national demographers and macroeconomists. Many of these factors will have to be translated into variables for urban growth modeling. While they could be conveniently ignored with impunity in high-growth scenarios, they are crucial to the accurate prediction of low-growth scenarios. However, these variables have never been considered in a spatially defined

*This lament is attributed to a South African citizen who had intended to practice planning in Britain after graduating from an American Planning School, and describes his frustration with the courses on 'developing' and 'advanced' countries that were the only

On the one hand, the task of developing appropriate parameters for spatial forecasting remains. On the other, the technician's in-house clients (administrators and politicians) will also have to be sensitized to the importance of factors that have been traditionally excluded as 'external' and 'complex' in the planning context.

The Population Projections and the Planning Office

Unlike national demographers, the planner who forecasts population is confronted with some occupational hazards that are both methodological and institutional. Currently available projection methods have limitations of their own, but within the context of the planning office the use of some of these techniques is problematic. Many of the methodological limitations are well known and will be dealt with only briefly here. The problem of selecting an adequate method of migration estimation is just one example of a whole series of such problems. But the institutional constraints are perhaps quite as serious and seldom openly acknowledged, perhaps in the interests of preserving the professional mystique of planning efforts.

Why Methodological Constraints?

It is understood and accepted that migration projections are the most crucial element when projecting the population of spatial units. The jurisdictional boundaries of such units are 'open.' Yet, planning projections have followed demographic methods, and very few planning agencies have developed or used migration projections. Migration estimation techniques generally use one of two types of approaches, either deterministic multivariate (causal or non-causal) modelling or transition probability matrices. Neither of these sets of techniques satisfies the set of institutional constraints to which we now turn.

What Are the Institutional Constraints?

Projections designed for planning purposes have to be made for fairly frequent intervals (e.g., one year) and for the relatively short time-horizon (fifteen years). Forecasts have to be in a form that is easily converted into estimates of capital and operating costs for various hard and soft services. Ideally, the inputs into the models employed should be derived external to the region for which the forecast is being made. These inputs should describe fully the parameters that cause the demographic changes.

But the list of requirements includes other equally important but somewhat contradictory conditions as well. Most planning offices have limited budgets and strict time schedules. The planning tradition is generally suspicious of the methodologist and prefers to employ a 'generalist' with some methodological skills. None of these circumstances is conducive to the adaptation to the planning scene of research techniques developed in an academic setting. Projection techniques, in addition, should be easy and simple to apply and possibly mechanized. While mechanization is easily solvable by computerization, it also creates its problems, given the archetypal planner we have described above: the modeling parameters may not be easily understood hence not altered to suit local conditions.

It is also common knowledge to all technical researchers that the operationalization of mathematical models involves countless judgments. Judgments are made on the nature of the modeled parameters, which variable to include and which to exclude, how best to approximate relationships, etc. Judgments are also made on the anticipated future behavior of the modeled parameters. A planner is required to defend and explain these models to senior administrators and elected officials. The planner is faced with the uphill task of defending the need for such judgments because the popular impression is that such a 'scientific' exercise should not involve any judgments. Thus, complex techniques that are both expensive and time consuming, but also involve 'non-scientific judgments' are virtually precluded.

The Tool Kit

It is now time to describe the general features of the tools to which we have been alluding. Needless to say, what follows is

not designed to instruct in the application of the techniques. The description of the general characteristics is grossly oversimplified, but it does not distort the evaluation that follows.

Approach I: The Demographer's Approach Modified

It seems self-evident that the best way to approach the problem is to adapt the tools of the parent demography discipline and apply them to the planning context. All population changes are made up of natural increase (i.e., the net of births and deaths) and the net of flows (in and out migration). The most rational method is to project these two components independently. That, in brief, is the demographic approach.

The demographic tradition has maintained and refined the record keeping of births and deaths for most societies since modern times. After the First World War, accurate record keeping procedures were extended to international movements of people as well. The demographer is thus dealing with a closed system with birth and death rates as his major variables. The trends in the behavior of these variables have been very carefully and accurately documented in the national context, for very specifically defined groups of age, sex, ethnicity, income, occupation, life-stage, life style, etc. Demographic projections treat migration as a new stock and apply the knowledge of age and sex specific behavior to these stocks as well. Further, demographers are mainly interested in the long term behavior of various parameters, so they need not study the effect of flows in detail, and, at least until recently, have not paid much attention to these characteristics.[3]

Urban planners have adopted this method of deriving and projecting birth rates and death rates (for different groups) and 'surviving' the existing stock of population by applying these rates—the familiar method is called cohort-survival. The missing element in the exercise is migration and very seldom is any equally accurate projection of migration ever derived. Since migration is the major factor in urban and metropolitan growth, the precision implied by the cohort-survival method is erroneous because the accuracy of a total is the same as the level of accuracy of its least accurate part.

Planners need population projections in order to anticipate and project physical and social facilities such as housing, schools, recreation space, and sewers. These needs are presumed to vary with age, sex, income, family size, and the life style of the people being planned for. But the method of population projection does not offer any independent information on these factors for migrants. The question, then, is not why so many population projections are 'wrong,' but why surprisingly few are inaccurate.

The answer lies in the self-fulfilling nature of high-growth prophecies. When urban population growth is very high, it is produced (in the western context at least) by migration. Such growth can either be 'projected' and the necessary services provided in advance, or the growth can be anticipated by the advance provision of extensive capital-intensive hard servicing such as water, sewers, and roads (as developers do). In high-growth scenarios you cannot tell the difference between the two processes when you look back. In other words, if you make reasonably high projections, you are not likely to go wrong. At worst, ephemeral shortages in semi-public goods (such as housing) can exist because the private sector does not respond to growth signals in the same way that the public sector does. And corrective capital-intensive measures were acceptable and widely used during a period when ecological sensitivity was minimal and the goodness of growth for the soul (and the body) was never challenged.

One other key factor explains why the forecasters did not go far wrong in high-growth settings. The nature of engineering design criteria and the manner in which they are set and applied is critical to such success. When an engineer is called upon to design a bridge, for instance, or a flood control system, the method by which he decides how strong a bridge to build is quite different from the way most people would estimate their own budgets or material needs. Engineering structures are designed so that the highest load they can withstand is extremely unlikely ever to occur (i.e., with a very low probability of occurrence within the designed life span). The defensible justification for such a practice is the durability of such structures. A bridge designed today will be around fifty years from now and technology being what it is, the provision of needs anticipated fifty years from now in today's design is acceptable, although it is capital intensive.[4] This practice of building in excess capacity has been carried over to the design of urban facilities as well.

In the few instances where actual growth did exceed such design capacities, the resulting 'inconveniences' could be tolerated and corrected in the interests of growth. It is, however, much harder to build excess capacity into municipally administered soft services. Metro Toronto's recent inability to find a sufficient number of 'working poor' eligible for its elaborately designed 'income supplement' program is a tragi-comedy but a good case in point. Political and administrative embarrassment resulted when the media exposed the fact that less than one half of one percent of the budgeted amount could actually be spent. The 'working poor' often have very little motivation to identify themselves to the authorities. By contrast, the Central York water and sewerage scheme was designed with a capacity way in excess of the anticipated growth north of Metro Toronto. This huge capital expenditure will be easily rationalized as 'foresight.'

The fact that senior levels of government will more readily subsidize one-time capital expenditures but not recurring operating expenditures is equally relevant in the local planning context. The main point is that soft services need a much higher proportion of operating budgets than capital budgets, and the predictability of these budgets is important because they may be subject to a high degree of fluctuation. Substitutability among soft services accentuates the problem of flexibility.[5] Therefore, if and when those services with large operating budgets begin to become more important (either quantitatively or politically) within the municipal budget, then more careful projection methods will be called for.

Approach II: The 'Your-guess-is-as-good-as-mine' Approach

In technological circles this is otherwise known as mathematical projection (remarks made here apply equally to the so-called 'apportionment' methods) which assumes either a constant share of the national total for the regional unit, or a constantly *changing share.* This approach involves choosing between a number of possible future rates of total growth (i.e., combining natural increase and migration), rates of changes of growth based on past trends and projecting these mathematically to obtain future magnitudes.

This approach has a major advantage. Urban-geographic theorizing about how various sizes and types of urban centers ('urban systems') grow has investigated these patterns empirically. Many of these mathematical models are reasonably good approximations of the world and they 'simulate' growth induced by the free play of the free market forces. There are, of course, a variety of possible mathematical equations and each geographer advocates his favorite.

The reader will notice that the approach is less costly than building elaborate models or using the tedious cohort survival techniques, and will yield equally good estimates of magnitudes. There is, alas, a very serious drawback because most theoretical explanations of the 'why' of the approach are complex and generally hard for the educated layman to believe, and they are hard to justify, when used singly, to appointed and elected officials.

Since the 'explanation' behind the model is complex and obscure at best (try explaining the 'urban-ratchet effect' to the next person you meet), it is easy for developers and other interested adversaries to use the equations of another equally famous urban geographer who advocates a higher rate of growth for the projection. Elected councils do not like the resultant dialogue, even if they allow it. (As one distinguished practi-

concisely, 'It ceases to be in English.')
The most common method of circumventing the problems mentioned is to apply Approaches I and II simultaneously so that the one can cross check the other. And as the reader can see, they almost always do, because migration, the major element in Approach I, is derived by methods not too different from the general approach of II. The important point is that it did not matter anyway because you were always (well, almost always) right.

Approach III: The 'Holding Capacity' Approach

A third approach, which for the lack of a better term will be called the 'holding capacity' approach, has also been in vogue. This descriptive term in fact encompasses a whole series of mathematical models, thinking exercises and map-coloring exercises. While this grab-bag description will not do for the purpose of learning the application of these approaches, or even to comprehensively catalog their merits and shortcomings, it is adequate for the purpose at hand.
The approach gained acceptability because it addressed projection issues in terms that were comforting to planners: land uses. Planners, even planning researchers, are apt to shy away from the explicit recognition of the economic ramifications of their professional activities. However, when future projections for an urban entity are developed in terms of the functional land use elements the result is more familiar and acceptable. Rules of thumb regarding the acreages of residential, commercial, industrial, and recreational land uses that 'went-together' were freely incorporated into projection models. Most modeling exercises originated in the transportation planning and engineering profession. They were designed to quantify, measure, and predict journey-to-work trips, journey-home trips, modal-splits, origin and destination desire lines, and several other equally esoteric parameters. The field is still largely dominated by transportation planners[6] and perhaps it is not surprising that Ontario's major regional planning effort had its origins in modest proposals for a transportation plan study.

The holding and generating capacities of these land uses and their 'appropriate' mixes were all arrived at by the use of a judicious mix of empirical observation and professional judgments, otherwise known as planning standards. To the extent that these judgments could be varied without a serious threat to the image of the profession, the holding capacities of urban jurisdictions could vary as well. Quite often, these standards were arbitrary. Their major claim to legitimacy was the fact that they had withstood the test of time.
And, too, in a high-growth situation (unmanaged growth) the planner who was busy arranging his reds, blues, and yellows on the land use map could count on customers, at least for his red and blue areas, and eventually his purple and yellow areas as well. If those yellow land uses (usually residential areas) caused minor inconveniences to those that inhabited them, such as the inconvenience of high price or low supply, solutions could be devised eventually. The important thing was that material prosperity ensured a low complaint level.
Several other observations will serve to reinforce the general argument that it did not matter if the planner went wrong with the holding capacity approach. The first is simply that high-growth scenarios offer greater choice, or at least create the *illusion of choice.* Plentiful job opportunities within a climate of high expectation of upward mobility obscure shortages in areas such as housing. Many 'wrong' projections can be reinterpreted as minor inconveniences that were not anticipated. Further, much of the clientele consuming planning services are often recent arrivals on that scene and their demands for better services are not yet organized. As pointed out earlier, most physical inadequacies could also be corrected by large infusions of capital (with the exception of housing). But it is much harder to deal with 'human' problems quickly and easily with large infusions of money, as most regional and national development efforts have proved.

The holding capacity approach, whether applied in the form of a mathematical model or by coloring maps, set upper limits to growth for a set period. As mentioned above, if the upper limit is exceeded, capital intensive corrective solutions may be applied and, more often than not, accepted. A further facilitating circumstance is the willingness of senior governments to finance capital intensive efforts but generally not operating budgets. Moreover, in the past, very seldom was the upper limit not attained; there was always plenty of growth to go around, at least in major metropolitan regions.

Projecting Population in the Context of Managed Growth

What changes in projection techniques and in their assumptions become necessary in a managed growth scenario? 'Economic behavior' in subsistence situations is predicated on very different sets of assumptions than similar behavior in commercial, market-oriented, and affluent economies, and the assumptions of the one circumstance are untenable for the other.[7] So too, managed growth situations leave less room for error in their population projections than in high-growth situations. The ramifications are more significant in detail and we illustrate some changes in the relevance of parameters.
In one of the more publicized exercises in Canadian growth management, the Greater Vancouver Region District's (GVRD) 'Livable Region Program,'[8] an attempt was made to determine the future population of the region based on the present residents' visualization of a 'livable' region. In other words, it is a modified application of the holding capacity approach, and can be classified as a cybernetical activity analogous to the developer's attempt to predict, through control. In this case, however, the *lower limits* are being consciously sought and are being determined both ecologically and through public dialogue.
In Ontario, on the other hand, efforts at translating the Toronto-Centered Region's growth options into a managed growth approach in the form of the COLUC report (Central Ontario Lakeshore Urban Complex) have combined some intuitive allocation procedures with those of the conventional gravity modeling techniques. It ran into several serious problems because the gravity modeling approach is best suited to a high-growth scenario. Some 'nodes' (i.e., urban centers) were allocated excessively high employment in relation to their populations, and these estimates had to be revised in the light of reality.[9]
In the case of the GVRD as well as in the case of the COLUC Region, the success of the projections will depend on whether they satisfy the requirements of spatially specific growth. It is not possible within the scope of this article to spell out and discuss all of these in detail, but it is certainly not premature to identify the nature of the problem and to list some of the relevant factors.
To phrase the problem slightly differently, what can be postulated about a slow-growth or a no-growth scenario within the Canadian economic and demographic context that affects the requirements of planning projections? With less growth to go around, (even if this reduced growth is *not* a result of conscious planning activity) less choice in employment opportunities can be expected. Both the variety and the number of jobs will be reduced, and this might include both existing and future employment. This circumstance, combined with high energy costs and reduced capital outlays on public and private transportation will necessitate a much more careful spatial forecasting and planning of the population-labor-force-employment-housing-soft services equation. With declining economic activity, mobility within municipal jurisdictions as well as between regions and provinces is also likely to decline because mobility depends both on actual and perceived job opportunities. If this latter factor is combined with the reduction of a floating flexible pool of labor, further declines in employment could easily result.
More active citizen participation in plan-

will in turn produce even a greater degree of local interest in government. The post-industrial man may indeed be more homey than his industrial counterpart. But stable neighborhoods might come as a mixed blessing. Resistance to 'outsiders,' however outsiders are defined, is bound to increase. Initially, as the researchers in the GVRD study found, active hostility and negative reaction may merely be directed toward 'visible' immigrants.[10] It is not hard to conceive of its extension, in subsequent periods, to 'audible' ones as well.[11]

Migration studies have continually documented the fact that most migrants go to high employment locations and that migration has been the conventional source of flexible and adaptable labor. The spatial impact of errors in manpower planning in situations of low mobility and low growth will have to be more thoroughly studied and better forecasting techniques will have to be developed. On the other hand, most migration studies, and especially immigration studies, emphasize that the major reason for immigrant concentration in metropolitan areas and central cities is simply that they can rely on each other for economic, social, and emotional support. Canadian immigration policy has encouraged this aspect by actively promoting the immigrant who is partly supported by near and distant relatives until he is launched into the system, thereby dispensing with the need for extensive social, educational, and employment support services. If jobs dry up, immigration, always responsive to economic opportunities, will dry up. Indeed, both the visible and the audible variety could dry up.

Short term curtailment is likely to have the most serious repercussions on metropolitan planning. In the long term, the 'burden' of dependents, the education of the young, and the provision of medical care for the aged will rise dramatically. While municipal jurisdictions may not worry about health costs, an aging population may not appreciate the tax burden posed by education costs.

Stable neighborhoods and regions will have Stability, combined with a continued expectation of a high level of soft services, will place ever increasing demands on the operating budgets of local jurisdictions. It was mentioned above that high-growth scenarios brought problems that usually could be dealt with through one-time capital intensive corrective measures. Low-growth scenarios, on the other hand, are likely to exert pressures for increased operating budgets. To the extent that senior levels of governments are reluctant to provide operational budget subsidies, as well as unconditional grants, local jurisdictions will have to devise means to predict and limit their operating budgets.

The magnitude and nature of operating budgets at the local level at any rate will be related to 'composition issues' (a demographer's term) as opposed to 'size issues.' Growth creates the need for capital intensive efforts. But stability concomittantly with citizen participation creates the need for more and better soft services such as police, education, recreation. The more stable the neighborhood, the more organized and the more vocal the demand.

In order to anticipate the different needs of neighborhoods and regions, and build local responsiveness into projective techniques, the projection of population composition becomes a more critical issue than size. The rational allocation of operating budgets, among competing spatial units and competing needs becomes crucial. In addition, in the absence of unconditional support of operating budgets, municipalities might begin to apply familiar tools like exclusive zoning and other ingenious analogues, to reduce, or at least control their operating budgets. The point is that people-oriented services will increase in importance, not merely because of changed values, but also because of reduced mobility. And stability produced by low-growth will create a more favorable climate for organized demands. Canadian examples of declining or stable urban areas are difficult to find. But Saskatchewan and Alberta are both instances of provinces with relatively stable growth since 1941.[12]

both in terms of the actual rise and decline in numbers, as well as in terms of the factors that caused such fluctuations in growth. The different relative rates of decline of rural and urban areas (that totaled to stability) also mean that Saskatchewan's growth history may not offer much insight into the future patterns to be expected in urban areas.

Prince Edward Island, on the other hand, is much smaller in size and geographically compact. It has also remained relatively stable,[13] and has successively transformed its role from a political and historical seat of power into an agricultural-recreational-tourist economy over the last century.

The economic ramifications of spatial stability in metropolitan areas are enormous. We have already mentioned the consequences of relatively less flexible labor markets. One can begin to speculate on other factors that might affect municipal and neighborhood planning. Such speculation will produce the list of preconditions that useful projection techniques will have to meet. However, if 'composition issues' begin to become important at a spatially identifiable level, then the time for the application of the demographer's approach may have arrived. The cohort-survival method is well suited to the prediction of composition though it is not without shortcomings. Demographic studies still deal with the relative long term, and short term 'kinks,' as they are called, continue to pose prediction problems. Small magnitudes in errors, acceptable in demographic forecasts, might cause serious problems at the local level.

In addition, the spatial prediction of economic variables, as illustrated earlier, is much more crucial in a slow-growth scenario than in a high-growth scenario. Small errors can translate themselves into large reductions in standards of living. And even the respondents in the Livable Region deliberations never did give much thought to the acceptability of lower standards of living.

NOTES

1 The distinction between the three tasks is elegant conceptually but begins to disappear in operation projections can be politically explosive exercises, although the technician might claim no normative or preferential choices.

2 The Alberta Task Force on Urbanization Studies and the Edmonton Growth Study, as well as the Edmonton-Calgary Corridor Study, were scrutinized while they were still in progress. Our apologies for not including Manitoba, the Maritimes, and Quebec.

3 In Canada, until the background studies for the 'Green Paper' on Immigration were published (Canada, Dept. of Manpower and Immigration, *Immigration Policy Perspectives*. Ottawa: Information Canada, 1974), Leroy Stone's studies were the only major works to deal with migration in any depth (Leroy Stone, *Migration in Canada*. Ottawa: Dominion Bureau of Statistics, 1969).

4 The acceptability of overdesign for engineering facilities and the philosophical, professional, and political ramifications of such practices are best discussed in an old but still quite relevant volume. See A. Maass et al. *The Design of Water Resource Systems*. Cambridge, Mass: Harvard University Press, 1962.

5 To mention one of a host of possible illustrations, consider the substitutability of 'recreation facilities' for 'continuing education' and vice versa.

6 Cynics might attribute this to the most abundant source of research funds (in the U.S.) when 'what was good for General Motors (i.e., highways) was good for everyone else' philosophy prevailed.

7 Development economics in the fifties and sixties failed to take this factor into account and accused poor ignorant farmers of 'irrational' behavior.

8 The characterization of the GVRD approach in this paper is based on H.N. Lash, 'Policy Research on the Distribution of the Canadian Population,' a paper presented to the Institute of Policy Research, Montreal, August 1975.

9 Projections for urban centers in the Region of York north and east of Metro are also cases in point.

10 This euphemistic epithet is Canadian bureaucratese for all non-white, not excluding Chinese, immigrants.

11 Defined, for the purpose of this paper as, 'migrants with accents.' It is not hard to see that such a criterion would run into problems since it could include 'Newfies,' who also have difficulty adapting to alien urban environments such as Toronto.

12 A reviewer cited these two provinces as 'laboratories in Canada where past stability and its components could be usefully studied.' Although these provinces have been relatively stable, the fact that these are provinces, and that they have needed federal development assistance and transfer payment to maintain living standards, distinguishes them from urban regions and neighborhoods.

13 P.E.I.'s population since 1901:
1901 - 103,259; 1911 - 93,728; 1921 - 88,615; 1931 - 88,038; 1941 - 95,047; 1951 - 98,427; 1961 - 104,629;