

A NEW DIRECTION FOR WATER RATES AND DEBT
FINANCING FOR THE CITY OF WINNIPEG

BY

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Abstract

A set of policy guidelines for the City of Winnipeg is developed upon which a recommended conceptual rate structure is based. The new concept involves charging a uniform rate for all water consumed, surcharging excess water use, and establishing a reserve fund for the purpose of financing system expansion. Also recommended is the institution of an annual meter charge which reflects potential demand, and plumbing code changes and informational programs which will result in a modification of water demand patterns.

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TO HEATHER AND CHRISTOPHER
FOR YOUR ENCOURAGEMENT AND PATIENCE

INTRODUCTION

INTRODUCTION

Utility:

The greatest happiness of the greatest number.

Webster's New College Dictionary

A significant event took place on March 26, 1919. It was the day on which the first water flowed through the completed aqueduct from Shoal Lake to the City of Winnipeg. It represented the beginning of a period in the City's history during which an unlimited supply of good quality drinking water was available to the citizens. The problems in obtaining this water supply were not simple and the history of the Greater Winnipeg Water District aqueduct is one of social injustice, economic hardship, and political maneuvering unequalled in the history of this city.

For the past 61 years the city has enjoyed an abundant water supply with water price structures that have made it among the lowest priced utility supplied commodities. In fact, this City currently enjoys one of the lowest water prices in North America.

The citizens will soon again be at a crossroads with respect to water supply. The Shoal Lake aqueduct is reaching capacity and the supply will have to be supplemented. In addition, rising costs for labour, chemicals, replacements and new facilities will severely affect rate levels. These are times of inflation and high interest rates and

the long term prognosis is for this trend to continue. These problems will be compounded by the City's self imposed limit on its borrowing authority which will have serious consequences on the supply, if available, of money for capital projects.

A good deal of criticism has been directed of late at the decreasing block rate method of obtaining utility revenue. It has been said that these types of rate structures are inequitable since high volume consumers pay the lowest prices. There also seems to be a problem with the present financial system through its inability to provide for the future and finance expansion in a rational method without causing enormous rate increases. The present system also appears to be unable to cope with unusual or emergency situations without unduly affecting rate levels. Finally the present system of percentage increases to rate levels seems inequitable since the increases are applied uniformly from block to block. The effect of this is cumulative as the percentage increases are applied across the blocks from year to year.

The focus of this study is to examine the question of rate structures and debt financing to establish if there is merit in maintaining the status quo, or if a new direction more in tune with today's social needs and values is in order. The study will examine not only the practical aspects of utility financing but also look into the theoretical justification for utility

and rate structures. Such an analysis would seem to be valid at this point in time since the mass consumption society of today is radically different from that of even twenty years ago when much of the early work on rate structures was done. Our affluent society has created new demands upon utilities through lifestyle changes brought on by technological advance. The question of needs and value are not the same as they were in years gone by and the ability to pay or to choose not to use the service must be taken into account.

The fuel shortage of the 70's has introduced a new term, one seldom heard in the 60's and that is conservation. Society has suddenly decided that it may be economically advantageous to use less or to "think small." The effect on the economy of this conscious decision can be seen all around us. For example, the auto industry has reacted by down-sizing cars and Manitoba Hydro, due to low load growth, has postponed much of its anticipated construction. Would not then a legitimate strategy be to defer expansion and therefore expenditures by control of service demand? This study attempts to deal with these issues and offers conclusions on the equity of such a strategy.

It should be pointed out right at the outset that this study is conceptual in nature. It attempts to deal with the issues through an analysis of the theoretical and equity positions while at the same time attempting

to produce pragmatically acceptable solutions. The study is not intended to be "A How To Do It" rate manual but will put forward recommendations, which if accepted form the starting point for a traditional rate study analysis.

Chapter one begins by examining the theoretical question of equity and the legitimacy of using pricing structures as a mechanism for manipulating the access to or use of goods. Some of the theoretical aspects of utility pricing are examined and their usefulness assessed.

In Chapter 2 a set of policy guidelines are developed which will serve as the foundation upon which the rate structure recommendations are made. It is mandatory at the outset that the policy decisions are made for it is only through understanding what one is trying to achieve that one will be able to develop rational methodology to cope with the issues.

Chapter 3 gives the reader some understanding of the historical continuity by outlining the physical and financial history of the City's waterworks system. If one does not know the past it will be difficult to comprehend the future.

The future is discussed in Chapter 4 where the physical requirements and financial impact that these requirements will have on the citizenry are outlined.

In Chapter 5 an analysis of conventional and innovative alternatives is then made, resulting in Chapter 6 with a set of recommendations and concluding

statement in Chapter 7.

The study deals with a particular utility in a specific jurisdiction, however, an attempt has been made to present the arguments in such a manner that they could be extrapolated to other kinds of utilities in other jurisdictions. The concept behind the study is that equality is a universally sought-after goal and that techniques may exist to make the goal a reality in a water supply.

THEORETICAL CONSIDERATIONS

THEORETICAL CONSIDERATIONS

a) Water Supply Models

Provision of a service by the public sector may be justified on a number of grounds including the failure of the private sector to enter the field, the need for stringent quality controls, or the ability of the public sector to take account of equity considerations in the distribution and pricing of the service. The supply of water is a service which is used by the individual, business, and industry to varying degrees and under a variety of conditions. What then are the criteria for insuring that this public service is required and that the costs for it are properly proportioned to each user?

Perhaps a logical starting point would be to determine if in fact a public water supply is a public good. This can be done by examining the genesis of the public water supply concept. In the beginning man used whatever water supply happened to be available at the time. This usually consisted of a nearby artesian well, river or lake. In areas where there was no water or where water quality was unfit for consumption the areas remained barren and undeveloped.

As urbanization began to take place deterioration of surface water quality from human pollution began to occur. In many areas local surface water quality was such that the water was unfit for human consumption. Water supply in cities usually consisted of a system of central wells, which were used by the entire community

at no cost to the individual. In 1554 the English Parliament institutionalized water supply by passing legislation which required that the city "provide for clear water for the residents of London."¹

The "town pump" method of water supply continued for the next three hundred years. In 1854 Dr. John Snow removed the handle from the Broad Street pump and ended a cholera epidemic in London.² The landmark realization that cholera and typhoid were water-borne diseases revolutionized the concept of public water supply systems. The threat of disease transmission from private supplies and the inability and lack of initiative by the private sector in supplying adequate quantities of safe water resulted in the large scale public acceptance of and confidence in community operated water supply systems.³ The incidence of water born disease in the U.S. dropped from 100 deaths per 100,000 people in 1950 to less than .1 deaths per 100,000 in 1980. This data would attest to the success of the role of the public water supply in promoting public health.

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1. LaHier, J.M. Historical Development of Municipal Water Systems in the United States 1776 - 1976. American Waterworks Association Journal. April 1976. Vol. 68. p. 174.
 2. Sawyer, C.N. and McCarty, P.L., Chemistry for Sanitary Engineers. McGraw - Hill Book Co. New York. 1967. p. 364.
 3. LaHier, J.M. op. cit. p. 175.

The World Health Organization sees the community water supply system serving more than the public health purpose. Their position is as follows:

"the community water supply system must service more than the bare minimum needs of safe water for drinking and culinary purposes. For health, comfort and convenience, additional quantities for bathing, washing and public cleansing are necessary. The ultimate goal is the provision of safe water of acceptable quality, and in adequate quantity, for home use and for public, industrial and recreational uses."⁴

If this then is the goal, can its implementation be justified on purely theoretical grounds? If it can, how does society equitably distribute the cost incurred in reaching this goal.

The two recent theoretical statements by John Rawls and Robert Nozick are both relevant and incompatible concerning the moral, philosophical aspects of equity. There is some benefit in examining the social policy implications of these philosophical theories in order to get some idea of the conflict which exists between the theory of equality and the theory of liberty. Rawl's A Theory of Justice⁵ directly addresses the question of what is just distribution in society or stated differently whether inequities are justified in society.

4. World Health Organization. Health Hazards of the Human Environment. WHO. Geneva. 1972 p. 351.

5. Rawls, J. A Theory of Justice. Harvard University Press. Cambridge, Mass. 1971. 607p.

In the final analysis it would seem that Rawls' conclusion respecting inequalities in society is simply that only those inequalities are justified which are to the benefit of the least advantaged. Inequalities which may produce greater productivity and thus greater benefits to all may be justified if they result from inequalities of position or resources.

Robert Nozick's book Anarchy, State and Utopia⁶ offers a theory which is diametrically opposed to that of Rawls. His position is that justice demands neither equality nor an inequality that must benefit the least advantaged, but rather that each person has the right to what he has justly acquired.

"Whereas for Rawls a central authority is entitled to distribute the fruits of everyones labor, for Nozick, only the individual is entitled to the fruits of his own labor and he has full right to the use and disposal of them"

Thus, we can see that these philosophical arguments are in themselves the main argument regarding equality as the only fair distribution and the main argument for regarding inequalities as justified and equality as an artificially imposed state.

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6. Nozick, R. Anarchy, State and Utopia. Basil Blackwell. Oxford. 1974. 367 p.
 7. Coleman, S.S. Rawls, Nozick, and Educational Equality. The Public Interest. 1976. No. 43. Spring. pp. 121-122.

In terms of water supply it may be instructive to evaluate each of the models to see if there is a theoretical basis for the existence of public water supply systems as we know them. The Nozickian notion would have a society in which water supply was at the discretion of the individual, with each family having its own source of supply and treatment if it so desired. Alternatively this position would allow for the entry of private enterprise in unlimited numbers into any market area to sell water in competition with other private suppliers in the same area. The price of the water and the level of service desired would be left to the choice of the individual.

A Rawlsian model of water supply would move in the direction of equality and individuals would lose individual liberty to a central authority which would impose equality. This would be the development of a public water supply system which would price its water and determine its level of service based on the needs of those least advantaged in the market area.

From these models it would seem clear that neither of these extreme positions would be the best for society. The egalitarian position would not take into account the differences that exist in society due to its complexity, such as industrial and commercial requirements versus domestic requirements and in addition would not recognize the benefits to society that can be derived from an

adequate water supply. For while adequate quantities of potable water are required for life the existence of abundant supplies can attract water using industries the benefits of which in turn are reflected in the total socioeconomic development of the community.

The individualist or inequality position cannot be justified for public health reasons in that many water borne diseases are communicable and access to a contaminated supply could well affect whole communities. In addition, since water is unique, in that humans require it for survival and for which no substitute exists, limiting access to it for economic or other reasons would not be condoned in our society. The models therefore offer little agreement on a substantive theory of distributionable justice.

Thus a position has been developed where water is an absolute requirement for life, must be controlled to ensure its quality in order to safeguard society from disease and also, should be available in various quantities and qualities to meet the needs of potential consumers in order to foster community economic development. Water supply it would seem can be defined as an essential service and a public good that cannot be adequately described by either of the models proposed but is a compromise position between the extremes.

b) Public Goods Theory

Samuelson⁸ proposed an elegantly simple theory of public goods. According to his definition, if a service is classified as a public good, it should be distributed in a way which gives everyone equal access, that is if a public good is supplied to one person it must be equally available to everyone else. His theory also recognized production efficiency; he stated that if an additional person enters the group to which a public good is supplied, there should be "no subtraction from any other individual's consumption of that good."⁹ This in essence means that equal access is cost-free and that the service is not subject to congestion. Finally, he said that equal access to goods classified as public is the only possibility.

Goldin¹⁰ in his examination of this truly egalitarian traditional public goods theory came to the conclusion there are few goods and services if any which fit Samuelson's theory from both a practical and theoretical standpoint.

The traditional position then is to consider some goods and services as public goods and that equal access is both necessary and efficient for these goods. In examining this position from an economic theory standpoint a conflict

8. Samuelson, P. The Pure Theory of Public Expenditure. Review of Economics and Statistics. 1954 Vol. 36. pp. 387 - 389

9. Ibid. P. 389

10. Goldin, K.D. Equal Access vs Selective Access: A Critique of Public Goods Theory. Public Choice. 1977 Vol. 29. No. 4.

arises between the individualism of economic theory, since it is largely based on an individualistic value system and the egalitarian principals embodied into equal access philosophy. Samuelson feels that if a service is worth having at all then everyone should have equal access for reasons of "necessity" (exclusion is impossible) and "efficiency" (zero marginal costs of serving additional persons).

In terms of a water supply system the equal access position is not truly the case. For example, a water distribution system has set boundaries beyond which services are not supplied. In addition within certain service areas anyone applying for a water connection is not necessarily granted a connection unless certain criteria are met. The size of the service connection also limits equal access in that large service connections can obviously supply more water than small service connections. The size of the service connection is determined by an established protocol.

Each of these items can be considered negotiable in dealing with the central authority. Engineering considerations must be taken into account to ensure that the desired access is practical and the access to the system is made selective by means of a tariff imposed on the new connection. This shows that price is an important factor which makes access to the service selective.

When considering Samuelson's efficiency definition everyone should be able to consume the same unit and not detract from another individual's consumption. Essentially this means that the service should be non-congestible and that there should be no rivalry among consumers. In terms of economic theory this position means that there should be a zero marginal cost associated with serving additional persons.

However, in the case of a public water supply there is always rivalry among consumers and the marginal cost of serving additional persons is positive. To serve more persons without increased congestion generally requires the provision of more facilities with the attendant capital and operating expenses associated with them. Alternatively more users can be served by using existing facilities, but only by increasing congestion which results in a lower quality service and therefore, is a "cost" to existing users. Once again cash price is a method of making access selective in that there is a positive relationship between the amount of the service used and the price that must be paid.

From the above it is found that a water utility does not fit Samuelson's definition of a public good. It does fit the more common definition in that water supply is a good the inherent quality of which requires public production. The above are certainly not all of the arguments pro

and con that can be made with respect to the equity considerations in water supply systems. They do however highlight the main thrust of the argument, that being that price is an important factor in determining access to water supply.

This would mean that water supply is not a service which is egalitarian in the traditional sense and therefore, this leads to a discussion of how utilities can impose prices on society which are in the best interests of everyone in the community.

c) Pricing Theory

The price of a service may take into account social considerations, as well as economic and operational considerations. A utility should have a pricing system which is fair for all sectors in society, and at the same time properly reflect the costs incurred in operating and financing a major service.

Lachky has suggested that the proper approach to rate making must include:

"a compromise of a number of rate making factors including cost of service, the present level and condition of the rate structure, the ability of customers to pay, the nature of the service area, the value of the service, and customer demand for service and competition."¹¹

This philosophy represents a deviation from the traditional cost/price concept in rate making, and raises the important question of whether or not public utilities should concern themselves with social problems. The Committee on Government Productivity-Task Force Hydro which examined Ontario Hydro operations suggested that there could be serious problems in determining the social implications of modifications in electricity rates. They said:

"we suggest that the solution to such social issues is to be found in the income tax machinery or through income supplements, rather than through departures from cost-based electricity rate."¹²

11. Lachky, C.C. Does Utility Management have Social Responsibilities. American Water Works Association Journal. 1977 Vol. 69 p. 299.

12. Committee on Government Productivity. Task-force Hydro Hydro Policy in Ontario: Financial Policy and Rates. Report #4. 1973. p. 81.

In discussing natural gas prices Lance Partridge, Chairman of the Manitoba Public Utilities Board, recently stated:

"fuel prices may soon be based on conservation and social needs, rather than on the actual costs of providing energy."¹³

It can be seen from the positions taken by each of these writers that there is a tremendous range of options that can be taken in establishing the type and the magnitude of the charges imposed on the public for the delivery of a service.

There are two fundamental techniques for obtaining revenue for services, these being taxation and fees. Historically, in the interests of greater equity and simplicity, general taxation took the place of fees as a method of financing many public services.

"The dominant doctrine came to be that citizens should pay for public services through compulsory tax levies based on capacity to pay and that public services should be uniformly available with special charitable provision for those who do not have the means to care for themselves."¹⁴

In terms of equity considerations, who pays the taxes, who gets the benefits and the value of those benefits, must all be considered. It could turn out on analysis that the distribution of both benefits and taxes would work disadvantageously for the lower income groups, and to the comparative advantage of those with larger incomes. Alternately

13. Partridge, L. Need for Fuel to Decide Cost? Winnipeg Tribune. September 12, 1979.

14. Muskin, S. An Agenda for Research in Public Prices for Public Products S. Muskin, editor. The Urban Institute. Washington 1972.p. 441.

it could be that the principal users might turn out to be the lowest income group and the tax burden may not rest on them in proportion to the benefits they receive. Neuner et al. examined the use of taxation rather than user charges as a means of funding water supply and concluded that user charges are a more equitable means of collecting revenue.¹⁵ Milton Karfoglis, who has given perhaps more thought to this question than any researcher advocates the use of service charges over the use of tax levies.

"although much research remains to be done before the distributional implications of service charge finance can be assessed fully it has been suggested that in some communities increased reliance on cost of service finance might ameliorate the conditions of the low income classes. Proportional utility rates and flat rates per house are specially suspect since they encourage inefficiency and lead to service rate structures that are more regressive in their effects than the property tax. The distributional problem created by service charges may be due to faulty pricing practices, rather than to faulty principle."¹⁶

Those public goods which cannot be divided into purchasable units, such as police protection and education, seem best handled through the general levy mechanism. With urban water supply the units of service can be

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15. Neuner, E., N. Popp and F. Sebold. User charges vs Taxation as a Means of Funding a Water Supply System. American Water Works Association Journal. January. 1977. Vol. 69. pp. 39-44.
 16. Karfoglis, M.Z. Local Service Changes: Theory and Practice in State and Local Tax Problems. H.L. Johnson, ed. University of Tennessee. Press 1969.p.195.

measured and the individual user can be identified easily. These factors can be used to assure that the price paid for the service is in proportion to the amount of the service used. Metered servicing can therefore be equitable and pricing can become a viable means of ensuring that the allocation of public resources becomes more effective. Quite simply this means that an individual should only pay for that quantity of service that is used by that individual. In this way the consumer is allowed to make priority decisions with respect to the amount of the service desired. In making the case for user fees Muskin et al. state the following:

"The economic case for the expansion and rationalization of pricing in the urban public sector rests essentially on the contribution it can make to allocative efficiency. Prices will provide correct signals to indicate the quantity and quality of things citizens desire and help bring about the proper balance between private and public production of these things. A properly designed price system can potentially serve this end whenever the public provision of a service, or the private use of a common property resource such as air or water, is accompanied by significant divisible or appropriable benefits accruing to identifiable individuals, provided the cost of its implementation and operation does not exceed the gains in terms of more efficient resource allocation. Many of the services provided by urban local governments appear to qualify by this criterion.

In practice, of course, it may not be desirable to exclude people by imposing user charges even when it is technically possible to do so; for example, because an objective of policy is to redistribute income in the form of a particular service, or because it is believed that individuals will, if faced with a money

price, choose to consume less of certain services than is considered socially desirable."¹⁷

Thus, while a reasonable case has been made for the existence and equity of water supply user rates it still remains to determine how these user rates can be set in a manner that will attend to the equity and policy considerations that must be taken into account. Three of the major considerations are; equity, that is fairness in charging beneficiaries, revenue production, and efficiency in the use and production of the public service.

In his review of the public finance literature Milliman found that in general the stress is on the equity and efficiency gains in having users pay for benefits received. The gains, however, are considered within the context of how to finance expenditures.

"problems of optimal resource allocation and efficiency are introduced only indirectly and are usually more concerned with the long run questions of investment in public facilities."¹⁸⁰

He goes on to say that the equity aspect of benefit charges is viewed generally as a matter of simple justice. In other words users of a public service should pay for its costs when the benefits do not spill over to other people.

17. Muskin, S. Public Prices for Public Products. S. Muskin, ed. The Urban Institute. Washington. 1972. p.11.

18. Milliman, J.W. Beneficiary Charges - Toward a Unified Theory. In Muskin op. cit. p. 29.

"the efficiency aspects of benefit charges are largely limited to the long run questions of proper investment in capacity or the optimal scale of service, and questions of how best to ration service from existing capacity are seldom discussed."¹⁹

Those proponents of marginal cost pricing feel that the present techniques for establishing utility rates are based in large part upon two principles that are questionable from the standpoint of efficiency in the use of resources. Namely that rates tend to be based upon recovery of historical or original costs and rates tend to be determined by the average cost of service, as opposed to the marginal cost of supply.

"Neither the public finance nor the public utility literature has succeeded in rationalizing the need for reimbursement of financial costs with the efficiency rationale of marginal cost pricing that may generate surpluses or deficits. The theory of marginal cost pricing stresses that investment and operating decisions on social investment should be made independently of reimbursement policies for individual lumps or units of productive capacity."²⁰

By way of definition the principal rule of marginal cost pricing says that the demand price should be made equal to marginal cost, with marginal cost defined as the incremental cost of production or the cost of each additional unit of production of a specific product. With marginal cost pricing resources are drawn away from alternative uses and the prices should reflect accurately

19. Ibid. p. 30.

20. Ibid. p. 33.