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THE CHALLENGE OF WASTE STEWARDSHIP AND SUSTAINABLE DEVELOPMENT: A STUDY OF MUNICIPAL WASTE MANAGEMENT IN RURAL MANITOBA

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Abstract. *Despite the recent enactment of federal and provincial reduction targets, the majority of government and private sector research has focused primarily on household recycling strategies while little attention was given to other dimensions critical to the achievement of sustainable waste management. Although distinct problems may exist in rural jurisdictions, the literature continues to address the problems inherent in the management of wastes in urban centers rather than rural communities. The aim of this research was to close this gap by examining the issue of municipal waste management in rural Manitoba. Special emphasis was placed upon: (1) the amount and type of solid waste generated, and associated management activities, (2) the social, economic, political and jurisdictional factors influencing regional strategies and (3) the level of awareness and willingness of rural Manitobans to address the solid waste problem. Questionnaires were distributed to the 104 Rural Municipalities (RMs) in the province from which a response rate of 40 percent was achieved, and waste management officials in four municipalities were directly interviewed to provide a more in-depth analysis. The most conspicuous conclusion of the study is that, like other communities, household recycling continues to be the primary waste diversion activity in rural Manitoba. There is a deficiency in perceptual recognition of a waste management problem as there is still available landfill capacity in the area. This factor may partly explain why the 4Rs (reduction, reuse, recycling, and recovery) strategies or initiatives are not vigorously*

pursued. Finally, this study reveals that the goals set by the Manitoba Recycling Action Committee for a 50 percent reduction in wastes going to landfill, from the 1988 level, by the year 2000 is not achievable unless a more comprehensive waste management strategy is implemented.

Objectives

The prime objective of this research is three fold: first, to review the current waste management approaches and the directions of current research, second, to determine the state and nature of municipal waste management in rural Manitoba, a typical agronomic Prairie region, and finally, to identify the factors that affect the success and failure of waste management programs at the local level. The format of the paper has been divided into three parts. In this part, Canadian waste disposal issues are reviewed in light of the problems of "throwaway societies" and the challenge of stewardship. The second part deals with the empirical case of Rural Municipalities (RMs) of Manitoba. In the final part, a discussion of major findings and conclusions is presented in the context of the policy implications of the study.

The Waste Disposal Problem and the Challenge of Stewardship

The Context of the Municipal Waste Disposal Problem

Modern industrial economies were founded on the use of vast quantities of natural resources and energy, and the economic health of nations has often been equated with the amount they have been able to produce and consume (Young 1991; Backman and Lindhqvist 1992). The relentless commodification of natural and human resources for economic gain in industrial societies has generated massive amounts of waste byproducts (Bringer 1992). With the rise of consumerism since the 1950s, more and more manufactured items were deliberately designed to be disposable and unrepairable. Many studies have confirmed that the increased use of synthetic materials altered the composition of the waste stream and this, coupled with the gaining prevalence of a throwaway mentality, established the framework for creating a long-term waste disposal problem (Hayes 1978; Melosi 1981; Parkinson 1983; Pollock 1987; Long 1989; Robertson 1990; Ekins 1991; Young 1991; Bringer 1992; Maclaren 1995).

In Canada, public concern over the disposal of municipal waste appeared relatively early in the development of the contemporary environmen-

tal movement. The open-air incineration of wastes was discontinued in the 1950s, but by the late 1960s the impacts of landfilling were becoming more apparent as incidents of surface and groundwater contamination were reported in various locations. The first Earth Day in 1970 heightened public awareness of environmental issues, particularly those in specific locales. The demand for new approaches to waste management grew in the early 1980s and municipal governments across the country found themselves in the difficult position of making ever-increasing amounts of solid waste disappear (Bury 1992).

The manner in which Canadians view municipal waste is undergoing a radical transformation as growing public concern for the natural environment coupled with a rapidly diminishing landfill capacity, especially in the surrounding areas of mega-cities, together with rising rates of waste generation, have created an urgent need for economically viable and environmentally sound management practices (Pollock 1987; O'Leary et al. 1988; Long 1989; Gottlieb 1990a; Isaacs 1991; MacDonald 1991; Maclaren 1991; 1995; Meredith 1996; Starr 1991; Smith 1992; Patterson 1994). Municipal governments, the most direct providers of public services, have begun to realize that the key to environmental and financial success in addressing the continuing crisis lies not in managing waste with more "hard" engineering solutions but in managing less refuse with "softer" publicly supported efforts to reduce waste at the source (Bury 1992; Poland 1992). What is appearing to be central to the issue of sustainable waste management therefore is the ability of institutions to attain simultaneously three associated goals: (i) to reduce quantities generated; (ii) provide environmentally secure disposal capacity for the remainder (MacDonald 1991); and (iii) siting-dispute resolution through negotiation and mediation (Andrew 1996), without compromising the ability of society in the future to meet its own needs (Heiman 1996).

Previous research and the majority of the relevant literature on waste disposal has focused on the necessity of sound solid waste management in large urban centers. Many of these investigations have been conducted in one city and/or single community settings such as census blocks, residential zones, or business districts (Lansana 1993). Although small cities and rural communities face significant waste disposal problems, which may be somewhat distinct and thus different from those of metropolitan centers, they have received nominal research attention. As a result, little comparative study is available to ascertain the similarities and variations between urban and rural communities as well as between geographical regions (Lansana 1993: 171). Many relevant research issues and questions have remained unanswered.

What is the nature and extent of waste disposal operation in rural communities? Does the nature of economic organization and type of resources in rural communities play any role in determining waste management practices? What is the rate of waste diversion? Are diversion and participation rates higher in some communities than in others? What factors instigate waste disposal and diversion programs in rural communities? What are the specific roles and responsibilities of regional and local governments? What are the specific revenues and expenditures associated with rural waste recycling programs? What variations are most significant between rural and urban waste management programs?

The metropolitan centers of the Great Lakes basin area pioneered waste disposal techniques and management strategies. For instance, with the closing of many dump sites during the post-war period (Anderson and Ward 1995), metropolitan Toronto commenced the commissioning of incinerators to cope with accelerated waste generation (Anderson 1993). This strategy was accompanied by an increased capital intensity in the collection and disposal processes. Since 1966 closures of incinerators have become the norm, due to cost and atmospheric pollution concerns, and the opening of major landfill sites became the main disposal technique. In recent decades municipal waste recycling has become a viable alternative to these earlier forms of disposal and management, especially in urban communities in Ontario. From a regional perspective, the evolution and relative success in waste disposal management in the Great Lakes region were closely associated with large population size, spatial constraints such as higher cost of landfill siting in close vicinity of large urban centers, favorable long-haul transportation cost and accessibility, a high degree public awareness of the environmental cost, and the enaction of legislation (Maclaren 1995; Hamberg 1995).

Lansana (1993), comparing urban and suburban communities in the state of New York, U.S.A., reports that the participation and success of the recycling programs in urban centers, as part of broader waste diversion schemes, were largely determined by demographic and economic factors such as age and income, public awareness, and the operational policies of local authorities. Moon (1994) assessed the overall solid management policies and actions in the State of Ohio and found that the managed volumes of solid waste is primarily a function of population characteristics, accessibility to transportation networks, location of the community, and open landfill availability. Overall, the findings derived from previous urban studies suggest that waste disposal, diversion, and management strategies are causally

influenced by population size, level of industrialization, infrastructure, environmental attitudes of residents, and the public policies.

In the context of rural jurisdictions, with their low population and agronomic resource base, the importance of managing solid waste and implementing reduction and recycling strategies should be assessed in reference to: i) the environmental impacts of waste disposal; ii) the limited scale of municipal resources; and iii) the distance from other rural communities. Because rural jurisdictions usually do not have the financial resources to invest in capital-intensive waste disposal facilities such as incinerators or Blue-Box collection systems, alternate strategies for reduction, reuse, and recycling are needed to extend landfill capacity and achieve waste diversion targets. Although the Province of Manitoba in Canada has not experienced a disposal crisis to the same extent as other eastern provinces of the country in recent years, the provincial government, under significant public pressure, has enacted several pieces of legislation since 1988. Coupled with increasing public opposition to the siting of new landfills, these new regulations have made the process of siting, operating, and maintaining a landfill facility more difficult. For instance, the revised Waste Disposal Grounds Regulations (150/91) under the Manitoba Environment Act 1988, introduced more stringent restrictions on waste disposal which were prompted by a variety of environmental concerns ranging from the effects of open-air burning to potential groundwater contamination (Manitoba Ministry of the Environment 1991). Because of the importance of agriculture, the potential loss of prime farm land for landfill sites is a major concern as it may have far-reaching effects on the economy and environment of rural Manitoba.

The Challenge of Sustainable Waste Management

The present thrust of waste management activities in Canada is towards operationalizing approaches which avoid or minimize the need for waste disposal. Poland (1992) and Ballard (1995) state that the management of both municipal and hazardous wastes has resulted in a social paradox: the public demands the convenience and services responsible for generating much of the undesired waste, and yet communities are unwilling to tolerate the development of facilities for dealing with waste materials. For municipal administrators and policy makers, decision making in these areas is thus a complex and difficult task (Gottlieb 1990b; Grogan and Schwartz 1992).

The Integrated Waste Management approach has been introduced to promote more efficient use of resources and environmentally enhanced

waste disposal methods (Maclaren 1991; Poland 1992; Bury 1992). The fundamental components of this approach involve the reduction of waste quantities, direct reuse of materials, recycling of materials, resource recovery through the use of energy from waste plants, and land disposal of residual material (Gerrard et al. 1991; Isaacs 1991; Maclaren 1991; 1995; Young 1991; Bury 1992; Ham 1992; Kimball 1992; Poland 1992; Willms 1992). The precedence of one strategy over another is determined by its ability to generate less waste, conserve more raw material resources, save more energy, and create fewer environmental impacts (Maclaren 1995). Despite the widespread acceptance of the "4Rs approach" (reduction, reuse, recycle, and recover) and its corresponding hierarchy, the recycling of household waste, the third preference, has received the most attention. Far greater emphasis has been placed on residential recycling than on reduction, reuse, or recovery options, since it requires little or no direct involvement of government and relies on the commitment of the individual consumer. The growing prevalence and implementation of the Blue Box program stands as evidence of this (MacDonald 1991). Although the success of the Blue Box has shifted the focus away from much broader waste management problems the program can be credited with a role in changing public attitudes: it has provided the early momentum in the movement from a throwaway to a conserver society (Flemington 1992).

Sharing the Responsibility: The "Product Stewardship Initiative"

The success of waste diversion initiatives and the achievement of provincial reduction targets cannot be realized through municipal recycling alone because the action of the individual consumer, and a commitment from industries, is critical to the attainment of goals. Fenton (1993; 1994) has recently offered a framework to address these issues by introducing the "Product Stewardship Initiative" (PSI), a strategy which involves government, industry and the public in the waste management negotiations. Essentially, product stewardship means that a company, as a producer, takes active responsibility for managing the life cycle of its products with proper regard to the environmental rights of the public (Fenton 1993; 1994). This initiative is at the heart of the concept of sustainable development since sound waste management involves much more than finding a place to deposit garbage at a reasonable cost (Fenton 1994). If the 4Rs hierarchy was built into the materials handling system of the economy, and "the loop" was closed by incorporating reclaimed materials into new products, any given level of

economic activity would generate a minimum of waste. The subsequent reduction in basic natural resource use would ensure their availability for future generations (Fenton 1994).

Fenton (1993) states that the implementation of a waste stewardship strategy requires the cooperation and compliance of all three levels of government. Senior governments in conjunction with industry stakeholders would set specific reduction targets based on the potential impact of the waste involved. Municipalities, that is local governments, would maintain their traditional role as the regulators of waste disposal yet would be given greater responsibilities for working with industry to develop a plan as to how targets should be met. Recognition of these concepts was realized by the Government of Manitoba through the initiation, in 1994, of the Manitoba Product Stewardship Program (MPSP) under the Multi-Materials Stewardship Board (MMSB). As part of establishing an institutional commitment, on April 1, 1995, the MMSB was transformed into a statuary corporation, titled Multi-Materials Stewardship Corporation (MMSC) (Fogg 1996).

Solid Waste Management Strategies in Manitoba

The population of Manitoba is approximately 1.2 million and it occupies 548,495 km^2 of land area (excluding 101,592 km^2 of inland waters). Although the majority of rural communities in Manitoba still have available landfill capacities, it is important to implement reduction and recycling strategies to extend the life of the province's disposal facilities. The problem should be viewed in light of settlement and population distribution patterns which show a high concentration in the capital city and a uniformly dispersed set of mid-size and small towns and villages. Nearly 90% of Manitoba's population lives within 200 km of its southern border with the United States, and more specifically, almost 70% of the population live in the City of Winnipeg (Statistics Canada 1992). Although the landfill siting problem is eased to some extent by the fact that substantial areas within the eastern Prairie zone do not contain potable ground water, many of its regions are subject to serious groundwater contamination. McRae (1989) and Turner (1992) produced groundwater vulnerability maps showing that both the Assiniboine and Souris Basins have "moderately high" and "high" vulnerability, primarily due to their sandy soil composition. Political factors also add to the limitation of siting options. The NIMBY (Not-In-My-Backyard) syndrome in Manitoba, which has been reflected in the recent dispute over selection of Winnipeg's new landfill site, poses an additional constraint to

landfill siting (Patterson 1994). Thus, the southern strip of the Prairie grassland ecozone may soon begin to experience the adverse impacts associated with diminishing landfill siting capacity.

In the late 1980s the provincial government, recognizing the possible consequences of consumer and industrial apathy towards waste reduction, established the Recycling Action Committee to formulate waste reduction targets for the province. In comparison to other Canadian centers, the two largest cities in Manitoba, Winnipeg and Brandon, are generally considered to be "behind the times" as recycling communities (Hamberg et al. 1997). This can be demonstrated through an analysis of the programs recently implemented in both cities by municipal and private interests. For example, Blue-Box recycling programs have been in operation in Ontario since 1983 while the first curbside service in Manitoba was implemented in Winnipeg in 1990. In comparison, Brandon did not obtain the convenience of curbside pick-up until the spring of 1992. This trend can be explained in part by the low population density of Manitoba compared to the dense population concentration in southern Ontario and Quebec and in part by the perceived notion in Manitoba that there is plenty of vacant and remote land that is suitable for the disposal of municipal waste (Hamberg 1995).

In response to the announcement of the National Packaging Protocol by the federal government in 1988, the Manitoba Minister of the Environment established the Manitoba Recycling Action Committee in the autumn of 1989 (Manitoba Ministry of the Environment 1991). The Committee has fourteen members representing a wide range of industrial, consumer, and environmental interests. The Minister asked the Committee to establish a framework by which the province should meet a goal set for the year 2000 of a 50% reduction of the 1988 level in solid waste generated in Manitoba. In May 1990, the Committee published the *Action Plan: A Waste Minimization Strategy for Manitoba in the 1990s* consisting of 56 recommendations in seven broad areas (Manitoba Recycling Action Committee 1990). On August 31, 1990, the Waste Reduction and Prevention (WRAP) Act was proclaimed by the Government of Manitoba to allow the implementation of the recommendations outlined in the *Action Plan.* The WRAP Act outlines the different responsibilities and roles for consumers, distributors and producers and different levels of government. It requires that the provincial government define the roles for waste minimization, negotiate the targets, monitor the progress, provide technical assistance, and allocate money for infrastructure development. The WRAP Act recognizes the need for ongoing coordination of the provincial government with municipal and federal levels

and with neighboring provinces and states to identify regional waste management opportunities (Manitoba Recycling Action Committee 1990).

Because the waste minimization and recycling strategies in the province were only implemented in the late 1980s, it may be years before the full effects of such policies are recognized. At the time of the survey for this research, only a few communities have established recycling programs. It is obviously necessary for the province to implement an aggressive strategy whereby all residents could have access to some facility such as a drop-off depot or curbside collection system. Establishment of the MMSC has already resulted in commendable progress, as multi-material collection programs attracted a total of 128 municipalities and five local government authorities to participate in the system. MMSC in general administers the product stewardship programs: it collects two cents per container of beverage products, and provides the lion's share (i.e., 80%) of the necessary funding for multi-material collection costs (Fogg 1996). In order to receive such financial support, local authorities must collect the following five products for recycling: newspaper, steel cans, aluminum cans, soft drink plastic bottles, and glass containers. In addition, there are three optional items: magazines, wax curtain, and box board.

The Rural Manitoba Survey Survey Design and Methodology

A two-tier survey design was formulated to generate the necessary information for this study. At the first stage, a questionnaire survey was conducted covering all 104 Rural Municipalities (RMs) of Manitoba. The survey instrument was designed to contain both quantitative and qualitative information pertaining to the economic base of communities, the nature of production systems (both agricultural and non-agricultural), the demographic and socioeconomic status of populations, the market for communities' economic goods and services as well as for recycled products, and the nature of waste management practices and future plans. The mail survey was distributed in the summer of 1994. A response rate of 40% was achieved as a total of 41 questionnaires were returned (Fig. 1): 18 RMs operated waste management programs and 23 RMs did not have any such program.

At the second stage, an in-depth survey of four RMs which were pursuing waste management efforts was conducted: Argyle, Brokenhead, Cameron, and Gimli (Fig. 2). The selection of these RMs was based on the type of recycling programs: two represented local or municipal authority operation, one is operated by volunteers, and the remaining one run by the

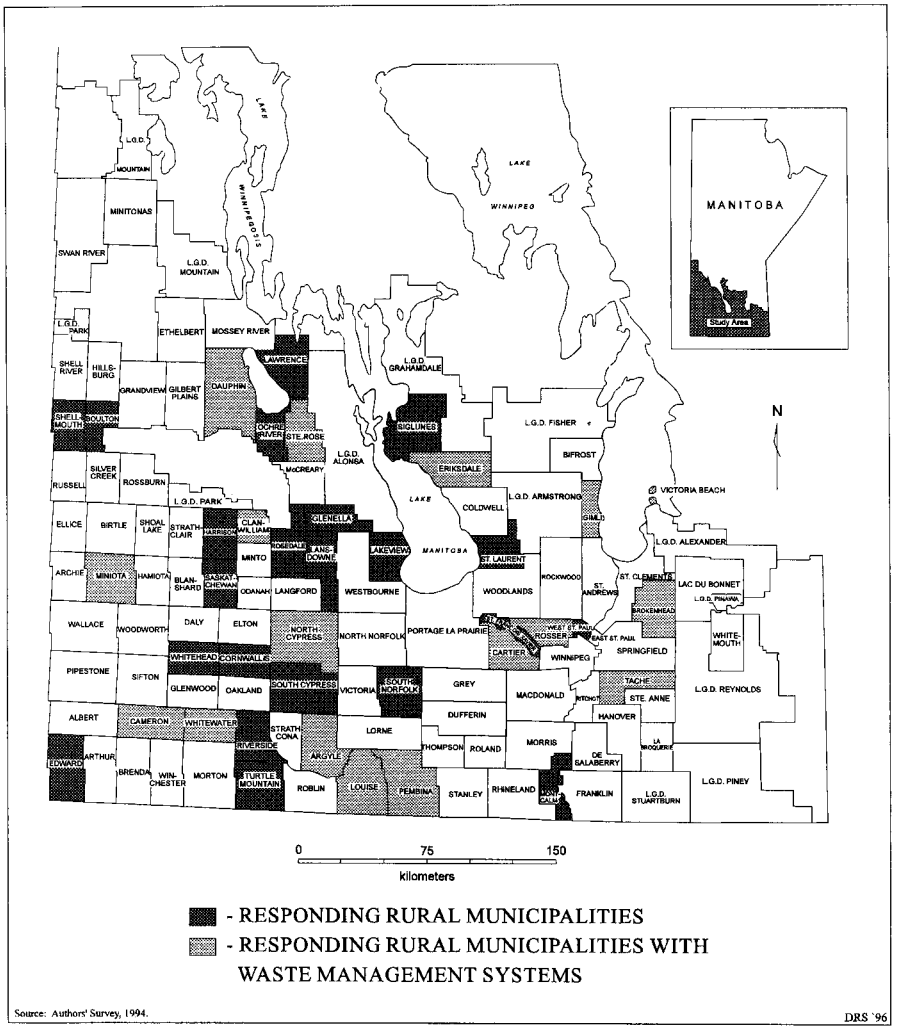
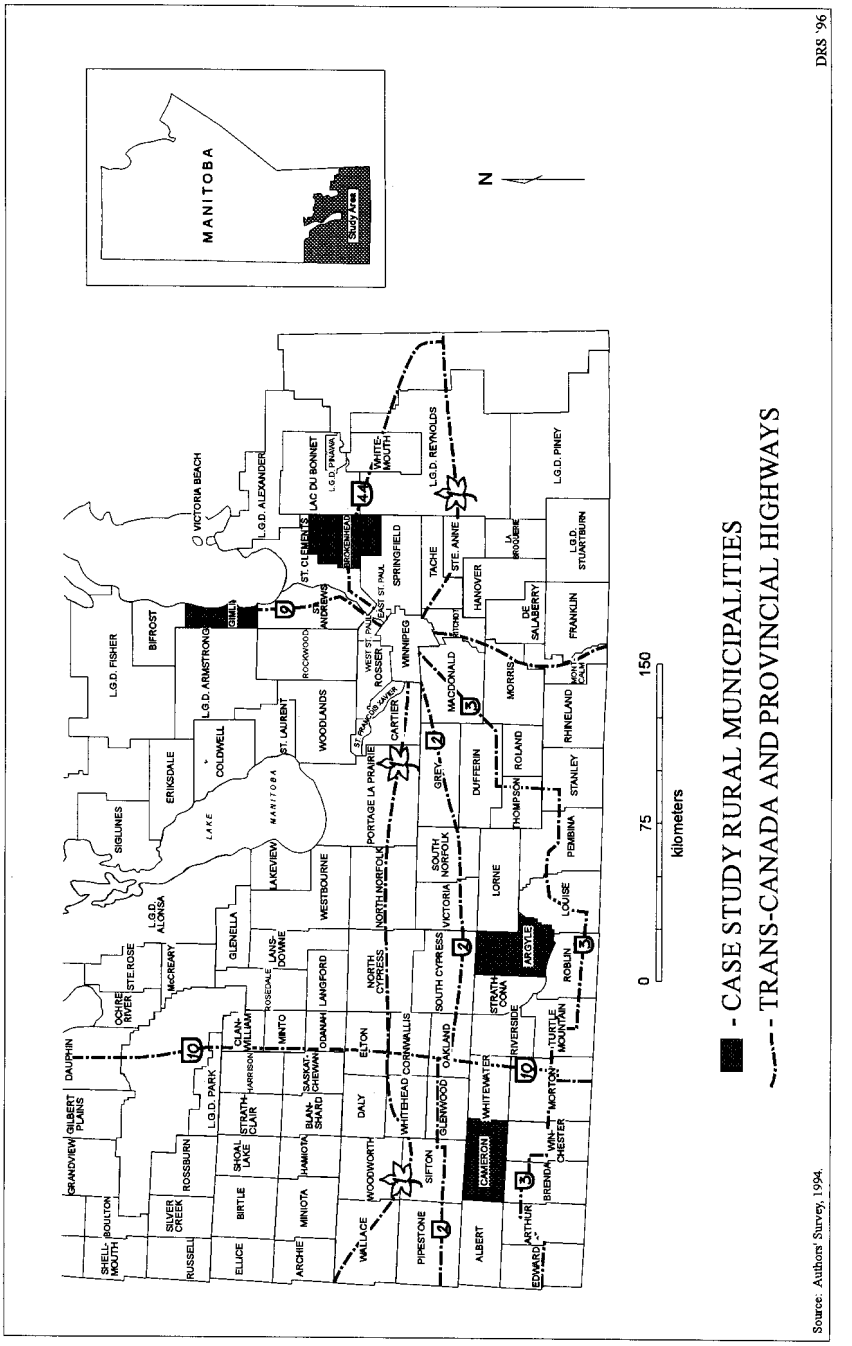


Figure 1 (above). Spatial distribution of Responding Rural Municipalities (RMs) and Responding RMs with Waste Management Systems.

Figure 2 (right). Location of Case Study Rural Municipalities and the Major Highway Transportation Network.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- CASE STUDY RURAL MUNICIPALITIES
- TRANS-CANADA AND PROVINCIAL HIGHWAYS
Source: Authors' Survey, 1994.
DRS '96

private sector. Regional representativeness, and type of socioeconomic resource base of communities were also considered in the selection process since location, infrastructure, and other economic, and spatial factors play a profound role in the variability of waste management programs. Municipal officials were directly interviewed by the investigators. Recycling depots, landfill sites, and other infrastructural facilities were visited regularly to collect primary data from local government officials as well as individual residents. Both an unstructured questionnaire and field notes were used as survey instruments.

Major Findings of the Mail-Survey

The average population size of the 41 responding RMs was 1,520 and their principal economic base is agriculture. All but one of these communities rely on production and income from this sector, the exception being the RM of Victoria Beach which depends primarily on recreation and tourism.

While the existing literature claims that either agricultural or industrial/commercial, economic production generates the largest volume of waste relative to domestic and municipal wastes, the survey data on the estimated proportions of waste-type reveals a different perspective. Respondents were asked to indicate the composition of the waste stream; municipal solid waste was reported to account for 40-100% of the entire stream. Industrial/ commercial as well as "other wastes" each comprise between 1-30% of the waste disposed in a community. This may be attributed partially to an overestimation of the municipal waste and partially to respondents' incomplete knowledge of agricultural waste generated in their municipality.

Since the commencement of waste management programs dates back only to the early 1990s (initiated in 1989 but the *mode* is 1991), the extent of acceptance is still limited; only 44% (n=18) of the responding 41 RMs have programs for recycling their solid wastes. Among the main waste minimization facilities, central collection depots were the principal one (67%; n= 12), followed by a central warehouse (17%; n=3) and collection bins (6%; n=1). Only the RM of Headingley has a curbside collection system. The most compelling reasons for establishing programs are, in ranked order of importance, a diminishing landfill capacity in the region (56%), followed by concern and pressure from citizens (28%), and initiatives from municipal councilors (28%) (Table 1). Predominance of a diminishing landfill capacity as an instigating factor may have stemmed from a number of factors such as a wider information field, a growing interest in environmental issues,

TABLE 1
FACTORS INSTIGATED IN ESTABLISHING SOLID WASTE REDUCTION PROGRAMS

Factors	(Multiple Response) Number n=18	Percentage
Diminishing Landfill Capacity	10	55.5
Concerns and Pressure from Citizens	5	27.8
Provincial/Federal Government Grants	4	22.2
Local Government/RM Officials' Initiatives	5	27.8
Others	2	11.1

promotion of waste problems by the media and both formal and informal institutions, and the experience of the NIMBY syndrome in the region. The types of recyclable goods collected in the RMs include glass bottles/jars (94%), newspaper and flyers (89%), PET plastic (94%), aluminum cans (94%), tin cans (89%), milk cartons (44%), plastic bags (28%) and other commodities (56%). The mean percentage of waste diverted from landfill sites is 22%. Municipal composting programs are not common, as only 2 of the 18 RMs (11%) had such a facility.

How are these programs running? What are sources of their funding? The majority of the municipal waste management programs were funded by the local or municipal government (72%) and more than a quarter of responding RMs received funding from two or more levels of government (Table 2). Information on the actual amounts allocated is generally sketchy. On average, local or municipal governments contributed $7,800, although the range varied between $100 and $25,000. These grants covered approximately two-thirds of operating costs. Only 44% of the RMs operating waste management programs were given financial support from the provincial or federal schemes; and the range of grant amount varied between $500 and $17,800. These grants are generally given for start-up costs and this level of support is not likely to be continued. Both paid and volunteer laborers

TABLE 2
AMOUNT OF ACTUAL FINANCIAL SUPPORT RECEIVED
DURING 1994-95 FISCAL YEAR

Range of Amount Received ($)	Sources	
	Local/Municipality	Provincial/Federal
Less than 2,500	5	3
2,500 - 4,999	2	2
5,000 - 9,999	4	-
10,000 - 14,999	1	1
15,000 and More	1	1

operate the programs: 22% (n=4) depends entirely on paid labor and 39% rely on both sources; only one RM depend solely on volunteers. The average hours of work is around 15 per week.

Data pertaining to market location reveal that they are quite dispersed. The Manitoba Soft Drink Recycling Depot collects the PET soft drink bottles, aluminum cans, and liquor and juice glass for more than 90% of the responding municipalities. Newspaper and flyers are usually sent to regional industries. Glass is generally crushed and used locally. These generalized patterns however may vary depending on the geographical proximity to cities, regional industries and local innovation.

The mean percentage of total municipal residents participating in recycling programs is 50.4%, with a range from 15% to 90% (Table 3). It appears that the RMs with varying types of recycling facilities have generally succeeded in drawing a substantial proportion of their population into the programs. In specific terms of citizen participation, 94% of RMs rated the programs as "very" or "somewhat successful". In terms of realized profits, 55% of RMs rated the programs as very or somewhat successful, 45% rated the programs as "not at all successful" or were unsure about their performance. Lack of secure markets for recyclable waste products (67%) was cited as the most significant factor limiting the realization of the project's

TABLE 3
RATE OF PARTICIPATION IN RECYCLING BY TYPE OF FACILITY

Rate of Participation (% of Population)	Frequency of RMs by Facility Type		
	Recycling Depot	Warehouse	Curbside Collection
Below 30	1	Nil	Nil
30 - 59	6	1	1
60 and Above	2	1	1

goals (Table 4). The other factors cited were minimal funding (50%), low market price (50%), and lack of citizen participation (33%).

One important feature of rural programs was a lack of inter-municipality cooperation: only 39% (n=7) indicated that they operate under a coordinated effort. This coordination requires that one community act as a regional collection center for the surrounding area. The responding RMs were evenly split on the issue of whether or not to accept a new landfill site in their area which would accept refuse from the surrounding region: 39% were willing, 33% were unsure and 28% were not willing to accept a new landfill site.

TABLE 4
FACTORS LIMITING THE REALIZATION OF PROJECTS' GOALS
(MULTIPLE RESPONSE)

Factors	Number n = 18	Percentage
Lack of Concerns Over Waste Problem	3	16.7
Lack of Citizen Participation	6	33.3
Inadequate Funding	9	50.0
Low Market Price	9	50.0
Lack of Secure Market	12	66.7
Declining Rural Population	2	11.1

The RM Case Studies

Argyle

Because Argyle is a large municipality covering approximately 769 km^2 there is not one centrally located landfill—the RM's 1307 residents can deliver refuse to Baldur, Glenora, or landfills in neighboring municipalities (Fig. 2). The town of Glenboro charges each resident ten dollars per year to dispose of waste in the landfill but cannot levy a similar charge on residents from other municipalities. For this reason, Argyle residents must now deliver waste to a landfill located within the municipality in which they pay taxes. This policy may have significant implications as a number of residents will now use the Argyle landfill resulting in a potential increase in volume which creates the need for a municipal recycling strategy.

In January 1993 a semi-trailer was purchased with a grant received from the provincial Environmental Innovations Fund. The Argyle Recycling Depot was established south of Baldur in the public works yard as there were no vacant buildings suitable for the purpose of separating and storing recyclables. The participation rate is nearly 50% in the municipal catchment area with an estimated diversion rate of 15%. Glass bottles/jars, newspaper and flyers, PET soft drink bottles, aluminum cans, and tin cans are collected at the Depot which is manned by volunteer high school students. Dedicated volunteers play an important role in maintaining the operation of the RM's program. Municipal officials cite the lack of storage space, low market prices, and a lack of secure markets for goods as the most significant factors limiting the realization of the project's goals.

Brokenhead

Following considerable public pressure from residents, the rural municipality of Brokenhead implemented a recycling program in the spring of 1994. As the town of Beausejour and the nearby village of Garson do not have waste disposal sites the communities utilize one managed by the RM of Brokenhead. For this reason, the overall vision of recycling in the municipality has been to divert some of the estimated 1429 tonnes of waste generated per year from this rapidly expanding landfill site. Municipal officials estimate that nearly 85% of residents are participating in recycling programs and are diverting nearly half of the residential waste stream from the Brokenhead landfill. Once sorted and separated, the recyclable commodities

are transported to markets in Winnipeg. The Association received an initial start-up grant from the provincial government for capital expenditures and officials are not concerned with government cutbacks now that the facility has been established.

Cameron

As part of an integrated waste management approach, the recycling of household solid waste has received significant political and economic attention in the rural municipality of Cameron. In 1991 the municipality established a new landfill site, with an approximate life expectancy of 100 years, to manage the 269 tonnes per year generated by the municipality's 338 residents. Situated two kilometers east of the town of Hartney, the new landfill replaces the town's original site which had polluted a nearby creek for about eighty years.

In the summer of 1991 local leaders (the mayor of Hartney, Leo Peloquin and two municipal councilors) with the assistance of several residents formed the Southwest Recycling Committee. With the money provided by a provincial government grant, the Committee secured a vacant building as a permanent depot site and was able to renovate and construct bins for 24 hour drop-off convenience. The Depot currently accepts glass bottles/jars, newspaper and flyers, PET soft drink bottles, aluminum cans, tin cans, and other materials including shingles, tires, and scrap metal. A composting program was implemented at the new landfill site in 1991 but few residents participate and the program is not yet satisfactory. The Depot appears to be far more successful as it was estimated that nearly 90% of municipal residents are participating. This high rate may be due in part to the regular advertisements and articles published in the local newspaper and the ten or so committed volunteers which make a continual effort to construct new machinery and find alternative uses for the recyclable commodities. The volunteers, mainly retired farmers, built the drop-off bins, a conveyor system, a glass crusher, and a paper shredder and are currently working on a plastic shredder. Among the more innovative uses for the recyclables include newspaper bales for hog farms and crushed glass under building foundations for rat and pest control.

The goals of the current program include the collection of different commodities and the reuse of more materials in the local area. The greatest limitations to the realization of the project's goals are government regulations against open-air incineration and the lack of recycling facilities in rural areas for oil and hazardous waste.

Gimli

The rural municipality of Gimli located 100 kilometers north of Winnipeg on the west shore of Lake Winnipeg (Fig. 2) has a permanent population of 2,800 with a seasonal influx of approximately 13,000 summer tourists. This significant increase in population coupled with initiatives from a local company, Cornerstone Enterprises, are among the main reasons for the implementation of a recycling program. Diminishing landfill capacity, despite the estimated 1,856 tonnes of municipal waste generated each year, was not considered to be an instigating factor.

Cornerstone Enterprises began collecting glass bottles/jars, newspaper and flyers, PET soft drink bottles, aluminum cans and tin cans in January 1989. In addition to operating the recycling depot, Cornerstone Enterprises also specializes in wedding and car decorations and lawn furniture. The recyclable commodities that cannot be reused within the municipality are transported to markets in Winnipeg. As no financial support was received from the provincial government, the municipality is greatly appreciative of the private initiative taken by Cornerstone Enterprises.

Discussion and Conclusions

Household recycling remains the primary waste diversion activity apart from collection and disposal. Some communities have established reuse centers for household articles, clothing, and building supplies, but formal composting programs have not yet been established in rural municipalities. In agricultural areas it is more likely that individuals maintain a compost pile for the household.

Respondents indicated that there is still no perceived waste management problem in the area as there is still available landfill capacity. Of the 23 RMs without any waste management program, nine have plans to implement a minimization program within the next two years, 14 RMs do not have such plans. The most frequently cited reasons for not establishing a program include budget or funding constraints and the lack of a perceived waste management crisis in the area. There is little doubt that the lack of data will make it difficult to monitor progress towards the 50% reduction target by the year 2000.

Until recently, solid waste management was one of the less complicated services that municipalities provided to their residents. Municipalities have traditionally managed and financed the collection and disposal of waste, but

an increasing number of local governments are becoming responsible for systems which include not only collection and disposal but recycling, reuse, composting, recovery, and the management of household hazardous waste. Local governments have a central role to play in the reduction of waste as it is recognized that municipalities are often the final repository for refuse and carry significant responsibility for contributing to the achievement of provincial waste diversion targets. For most municipalities, the main issue stemming from the increasing concern for managing wastes is who will pay for the increased costs associated with public education, recycling, and recovering value from waste. As stated earlier, under the WRAP Act and with administration by the MMSC, Manitoba residents began in 1995 to pay two cents as an environmental levy on each beverage container. The chief intention of this legislation is to pay for a proportion of waste disposal costs. How much revenue will continue to be allocated to local government authorities remains to be seen. At the present time, however, the incentives appear quite lucrative for the local authorities, as reflected by the participation of the majority of the RMs in multi-material collection programs. In the long run, sustainability of multi-material collection and recycling programs would need a close partnership between all levels of governments including the federal government.

An analysis of reduction, reuse, recycling, and recovery strategies from a national and provincial perspective demonstrates the eagerness of individual citizens to take personal responsibility for reducing environmental damage caused by their waste and the equally great eagerness of government to avoid any action that would impose costs on commercial and industrial waste generators (MacDonald 1991). Far greater emphasis has been placed on residential recycling than on reduction and reuse strategies as the former requires little or no government involvement and relies on the commitment of the individual consumer. As participation is not legislated, it is the responsibility of the individual to determine whether the activity is worthwhile. The success of curbside recycling can be associated with increasing levels of public awareness of not only the waste problem but of the overall condition of the environment. Thus it is reasonable to conclude that the majority of residents participate in order to do their part in alleviating environmental impacts (Hamberg et al. 1996). However, as the case studies have revealed, the degree to which predictors such as attitudes, incentives, management type, and convenience, explain waste diversion and management at the local level vary considerably. Implications of this finding could be quite significant although further research would be required for conclusive inference. It

may be argued that, rather than implementing a narrowly focussed policy strategy, a wide range of actions are needed for promoting a sustainable waste management system in rural communities. Compared to urban waste management programs which are primarily initiated and operated by institutional efforts, many rural programs are dependent upon individual's interests and leadership qualities. In the latter case, the individual may be affiliated with a public agency or private enterprise. This significant distinction should be accounted in the formulation of effective public policy on rural waste management.

While an analysis of individual attitudes and motivations was not a direct goal of this research it is evident that a variety of socioeconomic and demographic factors influence participation rates. In some instances, individual initiative and leadership may also explain the implementation and continued operation of recycling programs. This continued emphases and dependence on recycling programs however does not address the real nature or magnitude of the waste crisis.

Why have governments been reluctant to implement the strategies outlined in the integrated waste management approach? The answer is related to not only the unwillingness to enact strict legislation requiring the private sector to reduce waste and develop environmentally sound products but to "throwaway mentality" which is well-rooted in public attitudes. Consumers have indicated through purchasing action that they want reduced packing and recycled content, a definite indication that a slow shift from throwaway to conserver society is occurring. MacDonald (1991) states that despite the prevailing interest in "economic instruments," governments have shown no interest in implementing the most simple initiative, that is, increasing solid waste disposal costs enough to provide a real incentive for reduction. It has also been suggested that there are more pressing economic concerns on which government should focus including unemployment and the federal deficit and that once these problems are brought under control environmental concerns may be addressed.

Current waste reduction policies are centered on ideas and superficial plans rather than specific schemes for any definite action. Considering the current development of reduction practices, it will be difficult to attain by AD 2000 the stated goal for a 50% reduction from the 1988 level of amount of waste going to landfill. An immediate acknowledgement of this problem coupled with increasing consumer demand for reduced packaging and rapidly diminishing landfill capacity may be needed for success in instigating significant reduction policies and their associated legislation.

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