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Evaluation of a Rural Solid Waste Storage  
and Collection System: The Wayne County,  
Ohio "Green Box" Pilot Project

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Evaluation of a Rural Solid Waste Storage and Collection System:  
The Wayne County, Ohio "Green Box" Pilot Project

Fred J. Hitzhusen and Saïd Karkouti\*

Introduction

The "green box" concept refers to the use of bulk refuse containers (usually from 2 to 8 cubic yards in size) for solid waste storage and collection in rural areas. These containers are picked up and their contents mechanically dumped into a compacter truck for transport to a solid waste disposal or recovery facility. Bulk refuse boxes have previously been used to service industrial and commercial establishments, but Chilton County, Alabama was the first to implement a system of bulk refuse boxes to service a rural area. The original boxes were painted green which is the reason for the "green box" terminology [4]. Previous publications have discussed solid waste storage, collection, disposal and recovery alternatives [6,7] and described the "green box" system for rural areas [4,6,15]. This publication is primarily concerned with evaluating a rural "green box" pilot project including any impact on roadside dumping, system public and private costs, operational problems and financing. The final section summarizes some other on-going and needed research.

Wayne County like many rural counties in Ohio has experienced an increase in roadside dumping (see Appendix B, Part I) particularly since the passage of Solid Waste Disposal and an Anti-Stream Dumping Law in 1967 [8]. This legislation resulted in the closing of over 1300 rural township open dumps (including 14 open dumps in Wayne County) and in the establishment of one or more sanitary landfills per county. The

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increases in travel time to and user charges at sanitary landfills (as contrasted to the old township dumps) has made legal solid waste disposal much more costly for many rural residents. The resulting increased roadside dumping is unsanitary and is a form of sight pollution. It also imposes some economic costs on residents. Local officials have reported some evidence of increased maintenance costs of roadside mowing and ditching machines due to increased roadside littering. An effort to pick up the roadside litter has resulted in annual equipment and labor costs of \$32.00 per mile on the Wayne County roads where the clean-up operation has been conducted. In August, 1972, the Wayne County "Green Box" one year pilot project was implemented in two townships (Clinton and Plain) in response to the closing of township dumps and increased roadside dumping.

#### Pilot Project Setting and Organization

Wayne County is located in Northeast Ohio about 50 miles south of Cleveland and covers 551 square miles. The county had a total population of 87,123 in 1970, which represents an increase of 15.4% from 1960. The three cities of Wooster, Orrville, and Rittman included 37.2% (32,419) of Wayne County's 1970 population. Of the remaining population, the 1970 Census classifies 14.8 percent (13,128) farm, 34.2 percent (29,544) as "open country" rural non-farm and 13.8 percent (12,032) as residents of incorporated villages ranging in population from 205 to 2,373 [13]. Wayne County includes 12 incorporated villages and 16 townships. The "green box" pilot project townships (Clinton and Plain) are located in the Southwest corner of Wayne County and had 1970 populations of 2,835 and 2,014, respectively.

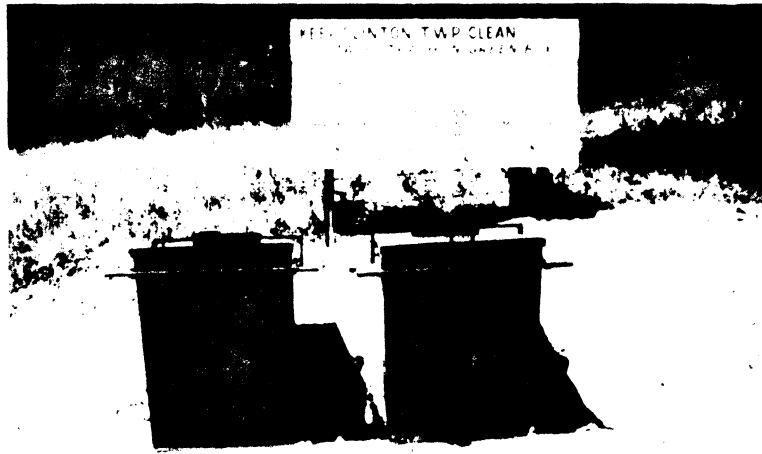
The pilot project implementation was a cooperative effort of a committee of county and township officials, a private hauler, County Health and Highway Departments, Soil Conservation Service, Farm Bureau, Cooperative Extension Service and the Department of Agricultural Economics and Rural Sociology at The Ohio State University. County Agent, Doyle Findley, was the primary coordinator of the project. The Timkin Company in Canton, Ohio, donated \$500.00 which was utilized for leaflets and signs. Clinton and Plain Township officials were responsible for the development of eight box sites. County and township officials utilized general revenues to share the cost of operating the system for the one year pilot period. A private hauler constructed 16 (two cubic yard) boxes for the eight sites and contracted with local officials at \$15/month/box to empty the boxes weekly and haul their contents to a private sanitary landfill. It was subsequently necessary to increase both the number of boxes and frequency of pick-up (two times or more per week) and to raise the contract price to \$25/month/box.

The pictures in Figure 1 illustrate an open dumping situation in Wayne County, one of the Clinton Township "green box" sites and a truck modified to mechanically dump the "green boxes". Figure 2 shows the location of each of the eight "green box" sites in the pilot townships. The sites were selected by the township trustees in Clinton and Plain with an effort made to locate a green box within three miles of every household. The sites were also located on the most frequently traveled roads where possible with consideration given to adequate room for vehicles to park safely while depositing trash. Additional boxes were constructed and added to the sites where the volume of solid waste deposited exceeded the existing capacity. Large "white goods" (kitchen appliances, etc.), construction materials, and dead animals were prohibited.

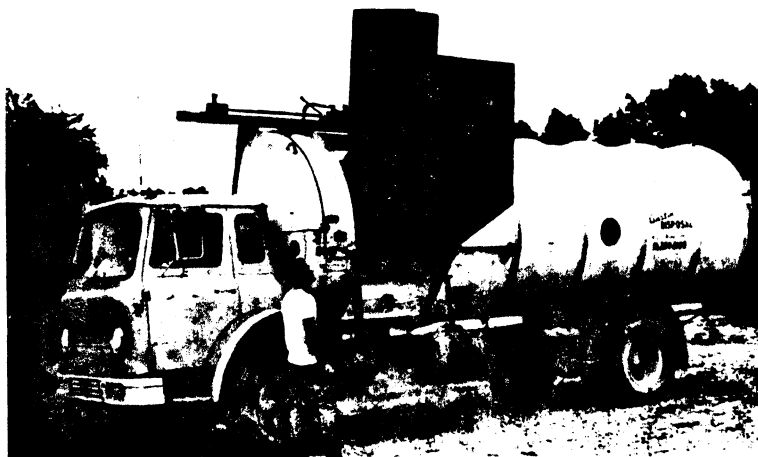
Figure 1. The Roadside Litter Problem and "Green Box" Concept



Open dumping situation

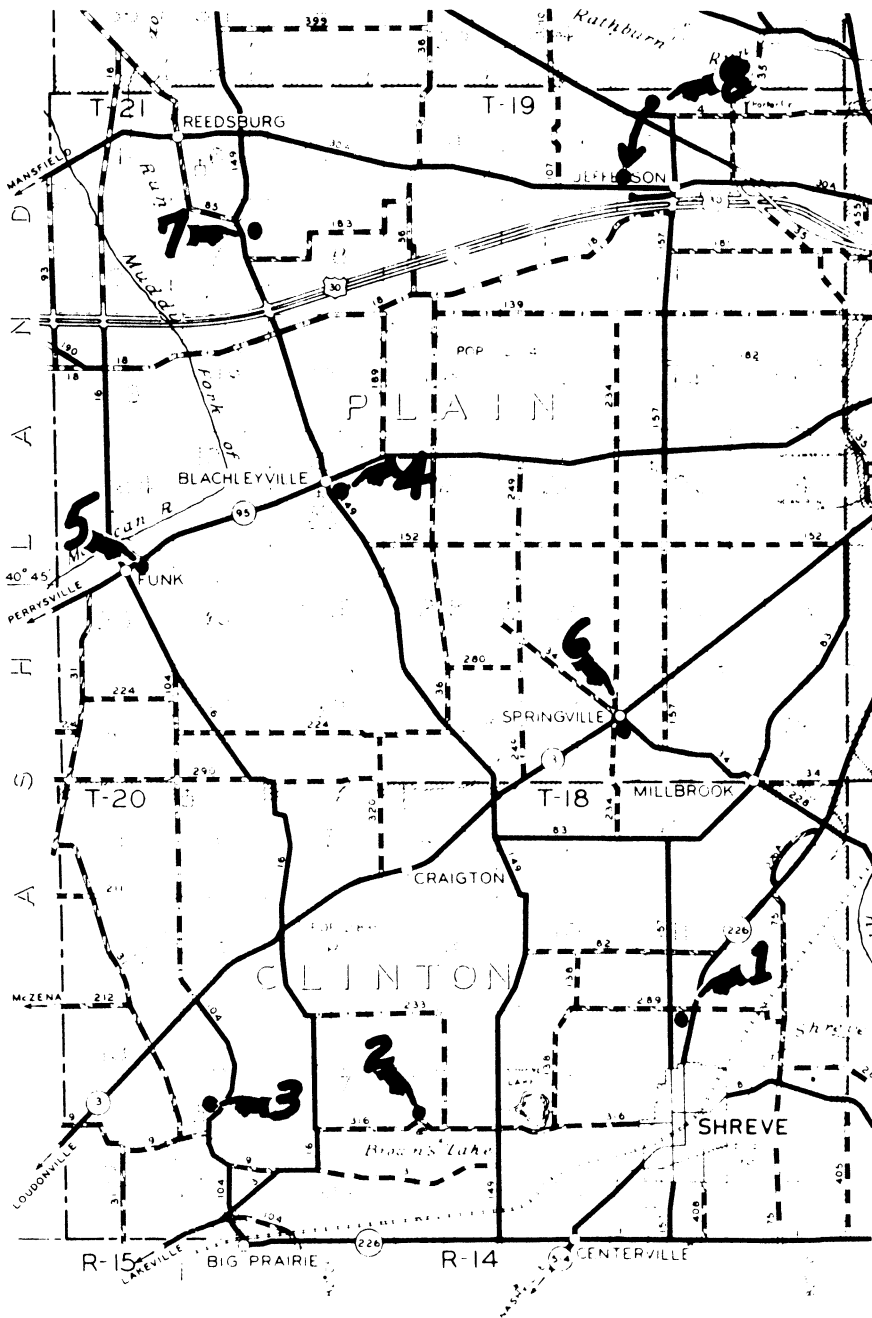


A "Green Box" site in Wayne County, Ohio



Truck emptying "Green Box"

Figure 2. Location of "Green Box" Sites in Clinton and Plain Townships





### Evaluation Objectives and Methodology

The evaluation of the Wayne County "Green Box" pilot project was implemented with the following major objectives in mind:

1. To determine the impact if any, of the pilot project on roadside littering in the pilot townships.
2. To determine to what extent people would use (and abuse) the system.
3. To estimate the full public and private costs of the system.
4. To survey residents of the pilot area regarding the severity of the solid waste problem and the feasibility of the "green box" system or some modified version for resolving the littering problem.
5. To identify the feasible alternatives for financing the system beyond the pilot one year period if extension was deemed desirable by residents of the pilot area.

Two procedures were developed to measure the impact of the "green box" system on roadside littering. The Wayne County Engineer agreed to keep records on the volume of roadside litter collected from county roadsides in the two pilot townships before and after the "green box" project was in operation for 6-7 months. Records were also maintained on the volume of litter collected from county roads in six other townships. Several 4-H club members in Wayne County helped do roadside

"litter checks" in both the pilot townships and in two control townships (Chester and Franklin). All the roadside litter was picked up and itemized from several randomly selected one-half mile segments of road in the four townships (see Appendix A).

To get a measure of use (and abuse) of the system the private hauler (Austin Disposal) agreed to keep a record of the trash collected from each of the "green box" sites. This information was summarized and reported monthly (see Table 1). The private hauler as well as township and county officials monitored the box sites to determine if the number of boxes and frequency of pick-up were adequate. Any evidence of problems e.g., dumping of dead animals, large appliances, etc., as well as dumping outside the green boxes was also reported.

About six months after implementation of the project, a questionnaire was designed, pre-tested, and mailed to 450 of the approximately 1,200 households in the unincorporated areas of the two pilot townships. Residents of the incorporated village of Shreve were not included because the Village operates its own landfill with no user charge to Village residents. This survey instrument was primarily intended to secure information on residents' attitudes about the solid waste problem in Clinton and Plain townships, including severity of littering, the feasibility and effectiveness of the green box system, willingness to pay for such a system, etc. One follow-up mailing resulted in a total of approximately 170 usable responses. Comparisons of the distribution of age, income, family size, etc. of the respondents with these data for the entire county

revealed that the sample was generally representative. Appendix B presents the questionnaire format and results for the two township pilot project area.

#### System Use and Abuse

There was a noticeable decrease in roadside littering in Clinton and Plain townships following implementation of the pilot project in those townships. The County Engineer reported approximately four times more litter collected per mile of county roadside in six townships outside as contrasted to within the pilot project area. This determination was based on the actual volume of solid waste collected from county roadsides during the annual spring clean-up operation which took place approximately eight months after implementation of the pilot project.<sup>1/</sup> Other more subjective assessments by local officials and survey respondents supported this finding (see Appendix B, Part III).

Use of the "green box" system was much heavier than anticipated by those involved in the implementation of the system. Three boxes (at sites 1, 2, and 8) were added to the original total of 16 and it was necessary to increase the original once/week pick-up schedule to a minimum of two times weekly at all box sites except Site 3. The latter resulted in an increase in the original contract price from \$15 to \$25 per box per month and some additional charge for overflow. Some problems were encountered due to both overflow and illegal dumping (e.g., dead animals, construction

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<sup>1/</sup> In the six townships (Paint, Sugar Creek, East Union, Wooster, Salt Creek, and Franklin) outside the pilot project, 35 truckloads of solid waste were removed from 170.65 miles of road or one load per 4.87 miles of road. In the pilot project townships (Clinton and Plain), four truckloads of solid waste were removed from 68.74 miles of road equaling one load per 17.18 miles of road. Franklin and Wooster townships are adjacent to the pilot project townships and may have experienced some benefit in terms of reduced roadside littering. Truck capacity was approximately five cubic yards.

materials, large appliances, etc.) particularly at Box Sites 1, 8, and to a lesser extent, 2. Overflow trash was ignited twice by vandals at Box Site 2. Table 1 shows the solid waste generated by month and by box site in the two pilot townships during the 12 month trial period. The overflow problems at box sites 1, 8, and 2 are understandable in view of the substantial four to five fold increase in volume of solid waste deposited at these sites over the duration of the project. The increases in volume at sites 1, 8, and 2 occurring after February 15, 1973, are substantial. The contract increasing frequency of pick-up and number of boxes (at sites 1, 2, and 8) was signed March 5, 1973, and probably resulted in most of the increase in solid waste deposited by residents who postponed using the sites during the early period of overflow.

Many of the problems of overflow and illegal dumping were attributed to "outsiders" by residents and officials of the pilot project townships. Suggested contributing factors were the location of Box Site 8 on Highway #30 in close proximity to the City of Wooster and the location of Box Site 1 (and 2 to a lesser degree) on Highway #226 in close proximity to the Village of Shreve. In the latter case, the incorporated village in question is located within Clinton township but was not considered part of the unincorporated pilot study area. Wooster is located outside the study area and its residents may have been a contributing factor to some of the overflow and "illegal" dumping at Box Site 8. A few cases of overflow also resulted from citizens dumping their trash beside the boxes before the boxes were full. A more logical explanation of the overflow problem is

Table 1. Cubic Yards<sup>b/</sup> of Solid Waste Collected by Month From Eight Green Box Sites in Clinton and Plain Townships, August 15, 1972 to August 15, 1973

Time Period	Clinton Sites				Plain Sites						Grand Total
	1	2	3	Total	4	5	6	7	8	Total	
8/15- 9/15	34	30	18	82	28	14	30	32	30	134	216
9/16-10/15	37	28	23	88	22	7	27	24	39	119	207
10/16-11/15	49	32	30	111	23	24	33	34	42	156	267
11/16-12/15	44	38	23	105	25	18	39	35	48	165	270
12/16- 1/15	48	46	34	128	33	23	36	31	55	178	306
1/16- 2/15	49	32	24	105	27	20	36	26	44	153	258
2/16- 3/16	82	46	35	163	24	27	35	43	62	191	354
3/17- 4/16	117	66	46	229	46	34	40	42	82	244	473
4/17- 5/16	138	87	46	271	41	30	49	44	81	245	516
5/17- 6/16	150	108	44	302	52	35	43	68	131	329	631
6/17- 7/16	196	126	47	369	56	39	50	61	129	335	704
7/17- 8/15	209	130	58	397	55	40	60	71	139	365	762
12 mo. total <sup>a/</sup>	1153	769	428	2350	432	311	478	511	882	2614	4964

Source: Data secured through the excellent cooperation of Mr. Kay Austin and employees of Austin Disposal, Wooster, Ohio.

a/ The pilot project was extended for one month in an attempt to work out (to no avail) the legal aspects of financing a county-wide system.

b/ All fractional yards are rounded to the nearest whole number.

simply having underestimated the size and/or number of boxes and frequency of pick-up required to handle the volume of solid waste generated (particularly from residents of Shreve) in the two pilot townships (see Appendix B, Part II for the survey respondents' suggestions for modification of the "green box" system).

#### Project Costs and Benefits

Direct public cost (to local government) of the system for the 12 month trial period was about \$7,249.<sup>2/</sup> This includes approximately \$800 for the preparation of the eight sites by the Clinton and Plain township officials and the remainder of \$6,449 paid to the private hauler contracting the provision and service of the "green boxes". The latter contract cost was shared about equally between Wayne County and the two township governments involved and was paid out of general revenue. A \$500 beautification grant from the Timken Company was used for signs at the box sites and for preparation and mailing of information on the availability and proper use of the system to the 1200 households in the unincorporated areas of the two pilot townships.

The indirect public and private costs and benefits are more difficult to assess. Time spent by local officials, extension personnel (68 man days) and several private citizens in planning, implementing, and "policing" the pilot project, could have been devoted to other problems.

<sup>2/</sup> The one month extension of the project brought the total direct public costs to \$7,724. Based on the survey results, it is estimated that 81 percent (or 970) of the households in Clinton and Plain Townships used the "green boxes". Thus, direct public costs to township and county government were about \$7.50 per household for the 12 month trial period. This estimate assumes a representative sample and does not consider dumping from Shreve residents or from people outside the pilot area.

The survey questionnaire revealed that about 70 percent of the trips to the various sites by users were special trips just to use the boxes--not enroute to some other destination. Users making these special trips incurred costs in both time and travel (average round trip of about 3 miles). For some users these costs exceeded their previous costs of burning, burying, roadside dumping, hauling to the Shreve Village "landfill", etc. Other users of the pilot system may have reduced their costs from previously subscribing to a private hauler service or hauling their own solid waste to a private landfill and paying a user fee.

Getting a good estimate of the net increase or decrease in private time and travel costs resulting from implementing the "green box" project is difficult. Table 2 illustrates the solid waste disposal methods residents of the pilot project area were using prior to and during the pilot project as well as the methods they anticipated using if the pilot project terminated. These survey results probably overstate the actual proportion of "green box" users in the study area and may understate the proportion of subscribers to a private hauler service. It was not possible to determine from the survey which of the three landfills (Shreve, Mt. Eaton, or Wooster) respondents were using prior to the implementation of the pilot project. Given the distance to both the Mt. Eaton and Wooster landfills, it was assumed most were using the Shreve landfill. Residents living within 1000 feet of the Shreve Village limits are no longer permitted to burn their trash due to a new Ohio EPA regulation [10]. Accordingly, additional travel and time costs incurred by these residents in changing from burning of trash to the "green box" system should not be considered as costs to this system.

Table 2. Methods of Solid Waste Disposal Utilized by Residents of Clinton and Plain Township Before, During, and After the Pilot Project (Percent)

Method	Before			During			After		
	Cl.	Pl.	Tot.	Cl.	Pl.	Tot.	Cl.	Pl.	Tot.
Private collector	27.7%	22.1%	24.1%	9.2%	11.3%	10.6%	8.0%	24.4%	22.0%
Take to landfill	35.3%	36.9%	36.4%	1.8%	3.4%	2.6%	40.0%	37.3%	38.2%
Burn	22.2%	29.4%	26.8%	3.7%	4.1%	3.9%	24.0%	26.7%	25.7%
Bury	7.4%	6.3%	6.7%	1.8%	1.0%	1.3%	2.0%	4.7%	3.6%
Green Box	--	--	--	83.5%	79.2%	81.0%	--	--	--
Other (Illegal Dumping)	7.4%	5.3%	6.0%	0%	1.0%	.6%	16.0%	6.9%	10.3%

Given these limitations some rough estimates were made for private time and travel costs before and after implementation of the system. Assumptions included 10¢/mile for travel cost and \$2/hour for residents' time spent disposing of solid waste. Private time and travel costs were assumed unchanged for one half of the residents (16.9 percent) that switched from a private landfill to the "green boxes" (same travel time and no user charge). For the remaining 16.9 percent an average monthly round trip of 10 miles was assumed. Residents (5.4 percent) shifting from roadside dumping to the "green boxes" were also assumed to incur no net increases in time or travel cost. Residents (13.5 percent) changing from a private hauler to "green boxes" incurred increased travel and time costs that were subtracted from the cost of subscribing (minimum of \$30/year/household)



to the private hauler service. Residents previously burning (22.9 percent) or burying (5.4 percent) their trash incurred additional time and travel costs in using the "green box" system. The average resident made 24 three-mile round trips to a "green box" site during the 12 month duration of the project. Given the foregoing assumptions, the net decrease in private time and travel costs (including decreased private hauler fees) was estimated at approximately \$2500 for the 12 month pilot project.

Other benefits of the system are equally difficult to measure. The reduction (four fold) in roadside littering should result in roadside clean-up savings on the part of state, county, and township government.<sup>3/</sup> Using the previous county road clean-up estimate of \$32/mile/year and assuming a linear relationship between volume of waste collected from roadsides and cost, it is possible to get some rough estimates of the savings. No clean-up cost records were available for either township or state roads in Clinton and Plain Townships. If one assumes the county road clean-up costs to be representative of all roads in the pilot area annual clean-up savings on the 165 miles of roads in the two townships would be \$3960. This may overstate the actual dollar savings since several township trustees indicated that they volunteered their services to help clean-up the township roads. Alternatively, this estimate may understate savings if township roads tend to attract relatively more littering than county roads.

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<sup>3/</sup> Total road mileage in Clinton and Plain includes approximately 33 miles of state roads, 69 miles of county roads and 63 miles of township roads. The four fold reduction in littering is assumed to reduce clean-up costs from \$32 to \$8/mile/year.

An unsuccessful attempt was made to determine the impact of the "green box" system on roadside mowing and ditching costs. Former County Maintenance Engineer, Mr. Sidney Bucher, examined shop maintenance records and talked to several employees involved in roadside mowing and ditching work. All agreed that reduction of roadside litter would reduce cut tires, broken cutter bars, etc., with the major impact being on mowing rather than ditching operations. However, it was not possible to determine the net effect of the pilot project on these costs. Out of a \$1.8 million 1972 budget for the County Engineer's Office, road mowing costs probably made up less than \$10,000. For the two pilot townships the amount probably did not exceed \$1500 for county roads or \$3500 for all roads in the pilot area. Any savings would be some proportion of this latter amount.

The benefits of a more aesthetically pleasing countryside cannot be readily translated into dollar savings. One might hypothesize that more littering leads to lower property values. However, testing such a hypothesis was beyond the scope of this research. More community pride and social interaction have also been suggested as non-economic benefits of reducing the rural litter problem. In this context the box sites or collection points may provide new opportunities for social interchange similar to that provided by the laundramat or the self-service car wash in many small communities.

The foregoing factors make it extremely difficult to calculate precise estimates of economic costs and benefits and virtually impossible to estimate full social costs and benefits of the Wayne County "green

box" pilot project. If one utilizes the full direct public costs (fixed costs are a relatively small part of direct public costs); assumes private travel and time cost increases and decreases to cancel out and utilizes the estimated savings in roadside clean-up as the only benefit, the project costs exceed the benefits by almost two to one (B/C ratio of .55).

Alternatively, if one also includes the \$2500 estimate of savings in private time and travel costs, allows for a 20 percent reduction in annual roadside mowing costs and amortizes the "green box" site development fixed costs, the project annual benefits are slightly larger than annual costs (B/C ratio = 1.07). Community residents and local officials must weigh any other economic costs and benefits (e.g., increased property values) as well as the non-economic benefits to make a final determination on the desirability of such a system.

If the community residents have decided that solid waste collection in rural areas is desirable and must be implemented, a cost-effectiveness rather than a benefit/cost framework is appropriate. In this case, the question becomes one of trying to minimize the cost of providing a given level of service rather than comparing costs and benefits per se. Under the cost-effectiveness decision-making framework the "green box" system or some modified version appears to be a viable and relatively low cost alternative. For example, door-to-door private pick-up currently costs about \$33/year/household for those residents of Plain and Clinton Townships using this service. Most users are located in the small villages.

Thus, considering this alternative as a county-wide system to include open country residents would result in increased hauling costs and an increased fee structure. Whatever the appropriate door-to-door collection fee for county-wide pick-up, the "green box" estimated cost of \$7.50/household/year is considerably less even if one increases this estimate by 50 percent to allow for any survey response bias or net increases in private travel and time costs.<sup>4/</sup>

#### System Operation and Financing

Many of the survey questions (see Appendix B, Parts II, III, and IV) were concerned with determining what modifications users would like to see in the operation and financing of the "green box" concept. Some general findings are evident. The vast majority of respondent users did not find use of the system to be either too inconvenient or too time consuming (96.6% and 97.2%, respectively). Respondents felt that location of the box sites was convenient and safe and that parking at the sites was not a problem. On the other hand, approximately half of the respondents felt that overflow (frequency of collection) and/or inadequate box size were important limitations of the pilot project system. Much of this problem was attributed to "outsiders".

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<sup>4/</sup> The 170 respondents may have included a disproportionate (when compared to the actual 1200 households) number of "users" vs. "non-users" of the new system. There is no way of precisely verifying the representativeness of the sample in this regard without contacting all 1200 households. However, this possible bias may have been off-set by "outsiders" using the system. Net increases in private travel or time costs might result from implementation of the "green box" system in a community where most residents previously had burned or buried their trash on their own premises.

One of the concerns expressed by private haulers has been the potential loss of many of their current door-to-door customers to the lower cost "green box" system. At the end of the pilot project, Austin Disposal reported losing not more than 25 customers out of 350-400 clients in the unincorporated pilot project area of the two townships. Some of these indicated that they would probably want back on the service if "their husbands tired of hauling their trash to the "green box".

Table 2 illustrated the trash disposal methods residents of Clinton and Plain township were using or anticipated using prior to, during, and after the pilot project terminated. The proportion of respondents utilizing a private hauler before and after the pilot project went from 24.1 to 10.6 percent. This suggests that the other private hauler (Wooster Disposal) operating in the pilot project area lost relatively more customers than did Austin Disposal. An alternative explanation (discussed previously) is that the survey respondents represented a disproportionate percent of the actual "green box" users that had previously subscribed to a private hauler service. Wooster Disposal would not release their customer list. Accordingly, one can only conjecture that the actual loss in customers was probably somewhere between 6 and 14 percent. This may not be a major problem, particularly if the private haulers affected have the contract for the provision of the "green box" service.

Financing of the pilot project beyond the initial 12 month trial period was (and continues to be) a primary concern. Respondents were asked

to answer three questions in this regard. Unfortunately, response level (24 to 101 usable responses) on these questions was quite low. Of those responding 30.7 percent favored a special household assessment, 26.7 percent favored some type of tax (property or sales). Of the remaining 42.6 percent, about half favored some other form of payment and the remainder could best be classified as the "best of both worlds". They were in favor of but did not want to pay for the system. Respondents indicated a willingness to pay for collection of trash at their place of residence ranging from \$ .25 to \$6.00 per month with an average of \$2.70.

Table 3 shows the breakdown of willingness to pay for trash pick-up at place of residence by the 54 residents responding.

Table 3. Willingness to Pay for Trash Pick-up  
at Place of Residence (n = 54)

Monthly Rate	Percent
Less than \$1.00	3.7
\$1.00	13.0
\$1.01 to \$1.50	5.5
\$2.00	44.4
\$2.01 to \$2.75	13.0
\$3.00	9.3
\$3.50 to \$4.00	3.7
\$5.00	5.5
\$6.00	1.8

The current charge for residential pick-up (primarily in the small villages in rural Wayne County) is \$2.75/month with a 60 gallon/week limit on volume. Three dollars/month is probably the minimum rate that would allow extension of this service to the more sparsely populated rural areas. The findings in Table 3 indicate that at this rate approximately 20 percent of the respondents would be willing to subscribe to private pick-up service. This finding closely approximates the finding in Table 2 that 22 percent of the respondents planned to subscribe to a private hauler service if the "green box" system terminated.

A previous publication has outlined the major provisions of the Ohio Revised Code with respect to the legal authority and financing of solid waste management in Ohio. Appendix C summarizes these legal provisions for municipal, county, and township government as well as for the County of Common Pleas and Boards of Health in Ohio. Unfortunately for rural areas, the Code tends to be much more specific and helpful to municipalities than to counties or townships. The primary alternatives for publically financing solid waste management include general revenue, revenue or mortgage bonds, general obligation bonds, service or user charges, Farmers Home Administration and Ohio Water Development Authority loans and a very limited number of EPA and HUD grants [9].

A five percent interest rate and 40 year repayment period make the FHA loan an attractive alternative for financing major solid waste collection, disposal or recovery capital expenditures. Federal Revenue Sharing can

also be utilized for this purpose if local officials are so inclined. The service or user charge<sup>5/</sup> appears to be the most logical alternative for financing annual operating expenditures (including debt service in the case where a loan was utilized to cover initial capital outlay).

Implementation of the service or user charge is unclear from the standpoint of the Ohio Revised Code. There is no Code provision for a variable rate structure. However, Erie County has two years experience with a variable rate or service charge to cover the cost of operating a landfill for county residents (see Appendix D) which has not been challenged in court. The Code also specifies that the unit of government implementing the user charge must own the equipment necessary for providing the solid waste collection, disposal and/or recovery service. It is not clear whether full ownership is required. Finally, the Ohio Revised Code makes no provision for any rebates or exemptions from the user charge. This is particularly problematic in rural areas where residents of small villages and other population clusters may desire to subscribe to a private hauler service even after the implementation of some modified "green box" or transfer station system.

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<sup>5/</sup> The service or user charge in the context of the Ohio Revised Code is a charge levied on owners of improved property. The charge is probably passed on to any renters. Ownership of improved property is assumed to be a proxy for solid waste collection and/or disposal service use.



### Summary and Policy Recommendations

The pilot project resulted in an approximate four fold decrease in roadside littering. The potential roadside clean-up savings from this reduction in illegal dumping in themselves would probably offset slightly more than half the cost to county and township government of implementing the "green box" system. Any net decreases in private time and travel as well as roadside mowing and ditching costs and the existence of other economic and non-economic benefits of a "clean and green" countryside would all contribute to a more favorable ratio of benefits to costs.

A precise estimate of the actual number of users was not possible due to potential survey bias and use of the system by "outsiders". If one assumes these factors to be offsetting, direct cost to county and township government for the 12 month pilot project was \$7.50 per household. Costs per household/year will probably range from \$7 to \$12 or more for a rural bulk container ("green box") system depending on population density; number, location and operating costs of landfills; size, number and location of bulk refuse containers; type and cost of box site, etc.

The volume of solid waste deposited at the box sites exceeded expectations and resulted in problems of overflow at three of the box sites. Some "illegal" deposits of construction materials, large appliances, and dead animals were also reported. In two cases, vandals ignited an overflow pile of trash at one of the box sites. This suggests that size of boxes and frequency of collection were inadequate. It would also

seem that more control over the box sites will be necessary than existed in the pilot project. It seems unlikely that additional educational effort on proper use of the system in itself will be adequate.<sup>6/</sup> This probably means a reduction in the number of box sites. Reports of "outsiders" driving several miles to use the box sites and Erie County's experience with resident use of a publicly supported landfill<sup>7/</sup> imply that greater distance between box sites may not have a significant affect on the level of use even though private time and travel costs may increase.

Financing continues to be a major problem regardless of the modifications made in the original "green box" solid waste storage and collection concept. An F.H.A. loan or Federal Revenue Sharing appear to be the most feasible alternatives for covering initial capital outlay. Any debt service and annual operating costs would appear to be best financed with a service or user charge. Due to the earlier discussed problematic provisions of the Ohio Revised Code, considerable uncertainty exists on the actual implementation of a user charge.

Some tentative recommendations seem possible. County or township governments in Ohio must first establish a solid waste disposal district (most counties have already done so). The county or township must own at

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6/ The earlier mentioned Chilton County, Alabama "green box" system has found it necessary to utilize a full-time "clean-up crew" to keep the box sites reasonably clean.

7/ Discussions with the Erie County (Ohio) Engineer revealed that roadside littering has been reduced and residents are driving up to 20 miles to use the county operated landfill. The landfill is financed with a variable user or service charge (see Appendix D) levied on owners of improved property in the county.

least part of the solid waste collection, disposal or recovery equipment (this has not been tested in court). The user charge must be levied on owners of improved property. Precedent exists (in Erie County) for a variable rate structure and it would appear that exemptions could be provided via a zero user charge for residents subscribing to a private hauler service.

#### Some Other On-Going and Needed Research

This rather modest research effort is a start towards improved decision making on solid waste management in non-metropolitan areas. Several additional and related questions need attention. For example, what are the economic and non-economic (public and private) trade-offs between the original "green box" concept (2 cubic yard boxes) and larger boxes (4 to 50 cubic yards) placed at less frequent intervals? What are the advantages and disadvantages of alternative box site designs (e.g. roadside, ramp, etc.) and the transfer station concept with compacting capacity?

A study currently underway in Humbolt County, California should provide some insights regarding alternative box sizes and types of box sites [14]. A pilot project in Baughman Township<sup>8/</sup> (Wayne County, Ohio),

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<sup>8/</sup> Baughman Township (in Northeast Wayne County) has implemented a modified green box system since the completion of the pilot project in Clinton and Plain Townships. The boxes are eight cubic yards and they have all been clustered in one location adjacent to the township garage. A retired resident has been hired to monitor the box sites and township residents have been issued passes to the sites. An earlier attempt to locate the larger boxes at several sites around Baughman Township resulted in many of the same problems encountered in the Clinton and Plain project. Some analysis of the Baughman project should be completed by Summer 1974.

a county-wide collection and disposal project in Meigs County, Ohio [1] and a project in Sauk County, Wisconsin [3] should also be instructive in this regard. A recent Ohio EPA publication outlines some current transfer station options. Unfortunately, no cost estimates (either public or private) are provided for any of the options discussed [12]. Van Wert County, Ohio has an operational transfer station that serves the entire county. The solid waste is hauled from this transfer station to Fort Wayne, Indiana for disposal and recovery. At the current level of operation the cost of operating this transfer station and hauling the compacted waste to Fort Wayne appears to be about \$10.50/Ton.

Another important question concerns the feasibility of regional or multi-county arrangements for solid waste management. Huie and Clayton analyzed the Southwestern Indiana and Northwestern Kentucky Regional Council of Governments and found that the additional collection costs of a regional solid waste management system would offset the economics of single-site disposal (sanitary landfill) on a multi-county or regional basis. A triple-site system provided the least cost solution for the region and one site per county was the least cost solution on a county basis. The City of Evansville, Indiana produces nearly twice as much solid waste as does the remainder of the region and was thus dominant. When Evansville was omitted from the region a single site system became the least cost regional solution [2]. The model utilized had some limitations including a very limited capacity for handling alternative landfill sites and the transfer station alternative. This fact combined

with the quite different conclusions with and without Evansville included in the analysis suggests the need for further research in this area.

The long standing assumption that burn and bury methods of solid waste disposal are the only feasible ones is being challenged with increasing frequency. The environmental as well as energy loss consequences of burn and bury methods are most often cited. The City of Franklin, Ohio has been operating a 150 Ton/day capacity demonstration solid waste recovery plant since 1968 [5]. Connecticut recently adopted a statewide plan emphasizing resources recovery based on a regional approach, i.e., the state is divided into "solid waste sheds". The Connecticut Resources Recovery Authority has been established to design, construct, and operate the statewide network of resources recovery facilities and its supporting transportation network. The Authority is a self-financing fiscal and administrative agency with no impact on the State budgetary process or debt structure. It follows a "user-pays" principle and revenues from the sale of recovered materials reduce user costs. The Solid Waste Management Task Force of the Ohio Commission on Local Government Services recently recommended that Ohio develop a state policy on resource recovery and study the feasibility of implementing some variation of the Connecticut Plan in Ohio [11].

Resource recovery may continue to be non-feasible for many of the rural areas in Ohio and elsewhere for some time to come. Connecticut is a relatively small and densely populated state and one must exercise caution in wholesale application of the Connecticut Plan. However, rural counties

of Ohio adjacent to the Cleveland, Cincinnati-Dayton, Columbus, and Toledo metropolitan areas need to be aware of the rapidly changing economics and technology of resource recovery. It is conceivable that several of these rural counties could be part of a future Ohio network of three or four "solid waste sheds" for recovery purposes. If so, much more research is needed on the economics of various transfer station alternatives in rural areas.

**APPENDICES**

Appendix A Solid Waste Collected in Clinton, Plain, Chester,  
and Franklin Township Roadside<sup>a/</sup> Litter Checks by  
Number and Type of Solid Waste Items, July 1972

Township	Number and Type of Solid Waste Items				
	Glass	Metal	Paper	Plastic	Other
Clinton	25	119	147	20	9
Plain	47	221	206	49	10
Chester	271	418	22	30	11
Franklin	142	340	108	34	30
TOTAL	485	1098	483	133	60
Percent of Total Items Collected	0.2146	0.4860	0.2138	0.0588	0.0265

<sup>a/</sup> Included roadway, road berm, ditch, and wooded area and fields immediately adjacent to the roadway. Several Wayne County 4-H club members and their leaders assisted in the litter checks.



Appendix B Questionnaire Format and Results  
 An Approach For Rural Communities Trash Problem

The problem of trash is viewed differently by various individuals. Please take a moment to help solve your community's trash problem by completing and returning this confidential form.

I. Please express your agreement or disagreement with the following statements by circling the symbol that represents your opinion.

	-Strongly Agree	-Agree	-Undecided	-Disagree	-Strongly Disagree
1. Trash disposal <u>is</u> one of the most important environmental problems facing our community.	51.3%	47.3%	0%	.7%	.7%
2. Living in a clean environment <u>is</u> important to my family's health.	57.4%	42.6%	0%	0%	0%
3. Most members of my community <u>are</u> concerned about the cleanliness of the community.	23.3%	61.0%	12.3%	3.4%	0%
4. I <u>am</u> concerned with littering of roads, roadsides, and gullies with trash.	58.8%	40.5%	.7%	0	0%
5. Disposal of trash in rural areas <u>is</u> as important as it is in the cities.	56.0%	43.0%	.6%	0	.4%
6. Much refuse <u>is</u> being disposed of illegally along rural roadsides.	54.6%	41.4%	3.0%	1.0%	0%
7. The closing of township dumps <u>has</u> a lot to do with the increasing litter on roadsides.	42.9%	42.9%	8.1%	6.1%	0%
8. Limited operation hours of landfills <u>results</u> in illegal dumping.	27.4%	54.8%	12.3%	4.8%	.7%
9. An effective way to fight the trash problem <u>is</u> to locate trash containers at convenient locations throughout rural communities.	51.7%	43.5%	5.0%	.7%	0%

II. This section should be answered by those who use or have used "Green Boxes" for disposing of their solid waste or trash.

On the basis of your personal use of "green boxes", please indicate your agreement or disagreement with each of the following:

	-Strongly Agree	-Agree	-Undecided	-Disagree	-Strongly Disagree
1. Few people in our community <u>are</u> aware of the "green box" project.	.8%	8.7%	19.0%	61.2%	10.3%
2. I <u>have</u> a better way of disposing of my trash at the present time.	1.6%	4.7%	4.7%	58.3%	30.7%
3. There <u>are</u> enough "green boxes" in my community to handle our trash problem.	3.9%	27.1%	22.4%	34.2%	12.4%
4. The location of the "green boxes" <u>is</u> convenient for my use.	29.7%	60.1%	5.5%	5.0%	.7%
5. There <u>is</u> enough parking space at "green box" sites.	22.8%	71.1%	1.5%	3.9%	.7%
6. The sites <u>are not</u> constructed properly.	1.6%	5.5%	19.7%	59.1%	14.1%
7. The locations of "green boxes" <u>are not</u> safe from a traffic point of view.	2.4%	7.0%	10.2%	67.8%	12.6%
8. It <u>is</u> difficult to use the "green boxes".	0%	2.3%	2.3%	67.3%	28.1%
9. The "green boxes" <u>are</u> too small to meet the needs of our community.	11.0%	37.1%	19.7%	27.5%	4.7%
10. Most of the time the "green boxes" <u>have</u> been full when I have tried to use them.	11.7%	39.1%	7.0%	38.3%	3.9%
11. I <u>do not</u> like to use the "green boxes" because the surrounding area is dirty.	.8%	4.6%	4.6%	66.2%	23.8%
12. People using the "green boxes" <u>are not</u> concerned with keeping the area clean.	4.7%	21.9%	11.7%	50.0%	11.7%
13. The "green boxes" <u>are</u> emptied regularly.	10.3%	59.6%	18.2%	9.5%	2.4%



III. Please indicate whether you think the "Green Box" project has value for solving the trash problem in rural areas by responding to each of the following.

	-Strongly Agree	-Agree	-Undecided	-Disagree	-Strongly Disagree
1. I don't think the "green box" concept <u>is</u> a successful method of dealing with the trash problem.	2.7%	7.5%	6.1%	46.7%	37.0%
2. The "green box" concept <u>will</u> help to eliminate litter in the roads.	29.5%	58.5%	8.7%	3.3%	0%
3. Most people who dump their trash illegally <u>do not</u> have any alternative.	4.0%	12.2%	12.9%	45.9%	25.0%
4. The "green box" concept <u>has</u> done an efficient job of cleaning up my community.	12.3%	49.4%	30.8%	6.8%	.7%
5. The "green box" concept helped me solve my trash problem.	35.1%	50.0%	6.3%	4.2%	3.5%
6. It <u>is</u> too inconvenient to take my trash to the "green boxes".	0%	3.4%	3.4%	58.7%	34.3%
7. It takes too much time to take my trash to the "green boxes".	0%	2.8%	2.1%	59.6%	35.5%
8. If the "green box" project keeps functioning, most people <u>will</u> give up their illegal ways of dumping garbage.	18.6%	52.4%	22.4%	6.0%	.6%
9. It <u>would</u> be difficult for our community to get along without the "green box" program.	27.6%	49.1%	16.5%	6.2%	.6%
10. Discontinuation of the "green box" project <u>will not</u> affect the community's trash problem.	0%	2.0%	8.9%	43.5%	45.6%

IV. In this section, please answer each question by checking the answer which expresses your practice the best.

1. What methods do you presently use for disposing of trash?

- |                      |              |                           |              |
|----------------------|--------------|---------------------------|--------------|
| 1) Private collector | <u>10.6%</u> | 4) Bury                   | <u>1.5%</u>  |
| 2) Take to landfill  | <u>2.6%</u>  | 5) Use "Green Box"        | <u>80.8%</u> |
| 3) Burn              | <u>3.9%</u>  | 6) Other (please specify) | <u>.6%</u>   |

2. What methods did you use prior to August 15, 1972 (implementation of "Green Box")?

- |                      |               |           |             |
|----------------------|---------------|-----------|-------------|
| 1) Private collector | <u>24.1%</u>  | 4) Bury   | <u>6.7%</u> |
| 2) Take to landfill  | <u>36.4 %</u> | 5) Others | <u>6.0%</u> |
| 3) Burn              | <u>26.8 %</u> |           |             |

3. How did you first learn about the "Green Box"?

- |                       |              |   |              |
|-----------------------|--------------|---|--------------|
| 1) Extension pamphlet | <u>48.2%</u> | 5) Friend                                       | <u>7.3%</u>  |
| 2) TV                 | <u>1.3%</u>  | 6) Newspaper                                    | <u>18.7%</u> |
| 3) Neighbor           | <u>8.6%</u>  | 7) Newsletter                                   | <u>8.6%</u>  |
| 4) Radio              | <u>1.3%</u>  | 8) Other (please specify)<br>(Seeing the boxes) | <u>6.0%</u>  |

4. How often do you use the "Green Box"?

- |                    |             |                |   |
|--------------------|-------------|----------------|---|
| 1) Everyday        | <u>3.8%</u> | 4) Once a week | <u>36.0%</u>  |
| 2) Every other day | <u>2.9%</u> | 5) Other       | <u>49.3%(Once or twice<br/>a month or when it is ready)</u> |
| 3) Twice a week    | <u>8.0%</u> |                |   |

5. How far is the nearest "Green Box" from your residence?

- |                     |              |                       |              |
|---------------------|--------------|-----------------------|--------------|
| 1) Less than 1 mile | <u>32.1%</u> | 4) Two to three miles | <u>19.3%</u> |
| 2) One mile         | <u>18.0%</u> | 5) More than 3 miles  | <u>5.3%</u>  |
| 3) One to two miles | <u>25.3%</u> |                       |              |

6. When is your trash taken to the "Green Box"?

- 1) On the way to work 15.5%
- 2) Special trip 70.7%
- 3) Other 13.8%  
(When it is full)

7. How do you get to the "Green Box"?

- 1) Walk 7.4%
- 2) Drive 89.5%
- 3) Have a neighbor take it 2.3%
- 4) Other .8%

8. What part of the week do you usually take your trash to the "Green Box"?

- 1) Early in the week 16.4%
- 2) Middle of the week 31.1%
- 3) Last part of the week 27.1%
- 4) Weekend 25.4%

9. In what kind of containers do you usually take your trash to the "Green Box"?

- 1) Plastic bag 68.8%
- 2) Paper bag 11.6%
- 3) Metal trash can 12.4%
- 4) Box 5.4%
- 5) Others 2.3%

10. What is the approximate size of these containers in gallons? 16.5%

11. How many of these containers do you usually take to the "Green Box"?

Av. 2.3% Range 1% to 4.5%

12. What method will you use to dispose of your trash if this project is discontinued?

- 1) Subscribe to hauler service 22.0%
- 2) Take to landfill 38.4%
- 3) Burn 25.7%
- 4) Bury 3.6%
- 5) Others 10.3 (Take to the woods or fields)

13. How do you think any future "green box" collection service should be financed?

- 1) Special assessment per household 30.7% what rate \$/month ? (Inconclusive Response)
- 2) Tax (be specific) 26.7%
- 3) Other 42.6%

14. How much are you willing to pay to have your trash collected at your place of residence? (\$/month) Av. \$2.70 (See Table 3)

15. At the present time, which one of the following "Green Box" sites do you usually use? (Circle)

Clinton Twp.	1) Site 1 Twp. Rd. 289, East of Co. Rd. 157	12.6%
	2) Site 2 Intersection of Co. Rd. 233 & Twp. Rd. 316	7.4%
	3) Site 3 Intersection of Co. Rd. 104 & Twp. Rd. 9	9.6%
Plain Twp.	4) Site 4 Blachleyville: Twp. Hs. St. Rt. 95 & Co. Rd. 149	9.6%
	5) Site 5 Funk: Old Feed Mill on St. Rt. 95	2.9%
	6) Site 6 Springville	17.8%
	7) Site 7 N. F. O. South of Reedsburg	9.6%
	8) Site 8 Jefferson: West of Jefferson on 30 A	30.5%

16. In your opinion, how can this method be improved or be replaced with a better method, for controlling trash problems in your community?

Comments:

Most suggestions related to:

More boxes being needed

More sites being needed

Emptying regularly

Boxes being full

Outsiders using

General Information

1. County Wayne 2. Township Clinton and Plain

3. Sex: Male 70.2% Female 29.8%

4. Race: White 98.0% Non-White 2.0%

5. Marital Status: Married 83.0% Single 6.6% Divorced 1.9% Widowed 8.5%

6. Number of people residing in household:

7. Permanent residence: Rural Farm 47.3% Rural Non-Farm 40.1%  
Town or village 11.8% City .6%

8. Length of Residence:     years

9. How many years of education have you completed:     years

10. Occupation of head of the family (please be specific): <sup>a/</sup>                     

11. Type of dwelling: House 88.8% Apartment 1.3% Duplex .6% Trailer 9.3%

12. Approximate your family income last year:

1) \$2,000 - \$4,999 15.5% 3) \$7,000 - \$9,999 30.1%  
2) \$5,000 - \$6,999 12.9% 4) More than \$10,000 41.5%

a/ Farming 25.0%  
Clerical and sales 13.9%  
Education 4.9%  
Prof & Mgr 9.0%  
Skilled & Manual 33.3%  
Retired 13.9%



Appendix C. Ohio Revised Code Provisions for Solid Waste Collection, Storage, and Disposal Operation and Financing\*

I. Municipal Solid Waste Management

Each municipality must provide some means of collecting and disposing of its solid wastes. It has the authority to set up an adequate system.

In general, a municipality may:

- 1) Adopt by ordinance and regulation requirements concerning the storage, transportation, and disposal of solid wastes.
- 2) Set up a public collection and disposal system.
- 3) Contract with individuals or private companies to provide collection and disposal service.
- 4) Grant franchises or exclusive rights to one or more individuals to provide the collection and disposal service.
- 5) Appropriate land for disposal facilities.
- 6) Abate any nuisance caused by the improper handling of solid wastes.
- 7) Finance the cost of purchasing land facilities and equipment for a solid wastes collection and disposal system from its general tax fund, by issuing general obligation bonds, mortgage revenue bonds, or with proceeds from a special tax levy. F.H.A. and Ohio Water Development Authority grants and loans are available.
- 8) Finance the operational costs and pay off the bonds of a solid wastes collection and disposal system from the general tax fund, from service charges, or from the proceeds of a special tax levy.
- 9) Contract with a county disposal district for solid wastes disposal.
- 10) Contract with another municipality or with a township for the joint construction, maintenance, and operation of a sanitary disposal system.

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\* These summary provisions are from a 1971 Ohio Department of Health publication, Solid Wastes Management ... [9]. For more detail, consult said publication.

## II. County Solid Waste Management

Counties in Ohio have authority to set up a public collection and disposal system.

In general, a county may:

- 1) By resolution of the county commissioners establish one or more solid wastes collection and disposal districts in the county outside municipal corporations.
- 2) Adopt rules and regulations concerning the operation of the collection and disposal system, including how the solid wastes will be stored in order to be collected.
- 3) Employ a nuisance inspector to enforce laws against nuisances caused by improper solid wastes handling.
- 4) Require approval of all solid wastes disposal systems set up in the county after a district has been established.
- 5) Financing the cost of purchasing or leasing land, facilities, and equipment for a solid wastes collection and disposal system by the issuance of revenue bonds, and by general obligation bonds if any of the improvements are to be paid by the county at large. F.H.A. and Ohio Water Development Authority Loans and Grants may be used.
- 6) Finance from service charges the operational costs and pay off the bonds or loans of a solid wastes collection and disposal system.
- 7) Contract with a municipal corporation, a township, or board of education for furnishing solid wastes disposal services.

## III. Township Solid Waste Management

The township trustees have authority to provide a solid wastes collection and disposal system.

In general, a township may:

- 1) Provide sanitary disposal sites for the township.
- 2) Create a solid wastes disposal district and operate a collection and disposal system.

- 3) Contract with independent contractors or municipal or county authorities for the collection and disposal of solid wastes.
- 4) Levy a tax within the ten-mill limitation of all taxable property within the district to provide the collection and disposal service.
- 5) Finance the system from service charges instead of a tax levy.
- 6) F.H.A. and Ohio Water Development Authority Loans and Grants may be used.

#### IV. Court of Common Pleas Authority

##### Section 6115.04, Ohio Revised Code

"The court of common pleas of any county in this state..... may establish sanitary districts within the county in which said court is located .....

Such districts may be established for any of the following purposes:

- (G) To collect and dispose of garbage;
- (H) To collect and dispose of any other refuse that may become a menace to health".

#### V. Authority of Board of Health

In general, boards of health shall:

- 1) Enforce sections 3734.01 through 3734.11 of the Ohio Revised Code and Chapter H.E. 24 of the Ohio Sanitary Code.
- 2) Provide for the abatement of nuisances caused by the improper handling of solid wastes.
- 3) Adopt regulations governing the storage, transportation of solid wastes.
- 4) Adopt regulations governing the construction of transfer stations.

Appendix D Erie County Solid Waste Disposal Rate Schedule, 1971

<u>Category</u>	<u>Annual Disposal Rate</u>
Residential Dwelling Units	\$9.00
Apartment Buildings	\$7.00/apartment
Trailer Parks and Rental Cottage Groups	\$5.00/trailer or cottage in area at billing time
Commercial-Schedule I	\$10.00/establishment
Commercial-Schedule II	\$25.00/establishment
Commercial-Schedule III	\$50.00/establishment
Commercial-Schedule IV	\$80.00/establishment
Schools & Colleges	\$55.00/1000 enrollment
Motels & Hotels	\$ 1.00/room
Dormitories	\$ 1.00/room (Four or less occupants to a room)
Hospitals	\$ 1.00/bed
Industry	\$50.00 (Minimum)
Non-Resident Fees:	
Private Autos	\$ 5.00/load
Autos with trailers	\$ 7.50/load
All other loads	\$10.00/ton (\$5.00 minimum)

The \$50.00 annual disposal rate hereinabove fixed for the category "Industry" is a minimum charge only, and shall be increased by the Sanitary Engineer as to each lot or parcel within such category as may be determined by him, such determination to be based upon the type and quantity of solid waste received at the sanitary landfill attributable to such lot or parcel.

The annual rate for dormitory rooms with more than four occupants shall be determined by dividing the number of occupants by four and multiplying by \$1.00.

Seasonal Residential Dwelling Units, Trailer Parks, Rental Cottage Groups, Commercial-Schedules I through IV, and Motels and Hotels shall be charged fifty percent (50%) of the annual disposal rate unless otherwise stated in the schedules and definitions. Any category occupied or in use six (6) months per year or less shall be deemed seasonal. Any category occupied or in use more than six (6) months per year will be charged the full annual disposal rate.

BIBLIOGRAPHY

1. Appalachian Regional Commission, "Meigs County Solid Waste Operations and Equipment", Athens, Ohio, March 1971.
2. Clayton, Ken and Huie, J. M., Solid Wastes Management: The Regional Approach, Ballinger Publishing Company, Cambridge, Massachusetts, September 1973.
3. Division of Program and Staff Development, University of Wisconsin-Extension, "116,000 Savings and Better Solid Waste Disposal!", October 1973.
4. "For \$7 a Year--Clean, Green Countryside", The Furrow, July-August, 1971, p. 34.
5. Herbert, William and Flower, Wesley A., "Waste Processing Complex Emphasizes Recycling," Public Works, June 1971.
6. Hitzhusen, Fred and Pugh, Al, Solid Waste Management in Rural Ohio: The "Green Box" Storage and Collection Concept, ESM 485, Department of Agricultural Economics and Rural Sociology, OSU, December 1972.
7. Huie, John M. Solid Waste Management: Storage Collection and Disposal, EC-397, Cooperative Extension Service, Purdue University, Lafayette, Indiana, 1972.
8. Ohio Department of Health, Bureau of Environmental Health, Interpretive Guide for Solid Waste Laws and Regulations, 2251.32, March 28, 1969.
9. Ohio Department of Health, Solid Wastes Management: Municipalities, County Commissioners, Township Trustees, Courts of Common Pleas and Boards of Health, 2352.32, 1971.
10. Ohio Environmental Protection Agency, Open Burning Standards, Regulation EP-12, September 10, 1973.
11. "Solid Waste Management in Ohio", Resource recovery recommendations of the Solid Waste Management Task Force of the Ohio Commission on Local Government Services, October 12, 1973.
12. Solid Waste Training Unit, Ohio Environmental Protection Agency, Transfer Stations 1973: Solid Waste Management Handbook.
13. U. S. Bureau of the Census, U. S. Census of Population: 1970 Number of Inhabitants, Final Report PC(1)-A37 Ohio.
14. U. S. Environmental Protection Agency, Rural Storage and Collection Container Systems, EPA-SW-41 DI, 1972.
15. "Will Green Boxes Cut Trash", Buckeye Farm News, October 1972, p. 36.