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ROADMAP FOR MOVING RECYCLING AND DIVERSION FORWARD IN COLORADO: STRATEGIES, RECOMMENDATIONS, AND IMPLICATIONS

FINAL REPORT

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ORGANIZATION OF REPORT

1.0 EXECUTIVE SUMMARY

1.1 Project Purpose and Approach

According to *BioCycle* magazine, Colorado's diversion rate languishes at a low 12.5%. This puts Colorado in the lowest 20% of states in terms of recycling rate, in the company of states like West Virginia, South Dakota, Mississippi, Alabama, and others. States around the country that are finding recycling rates stagnating are looking at options for next steps in energizing diversion progress. Recently, Wyoming instituted a statewide law requiring comprehensive plans for solid waste management in the future – a requirement not in place in Colorado.

In late 2007 Colorado's Governor Ritter adopted a Climate Protection Plan, and solid waste can have a productive role to play in that plan. Indeed, some communities have found that solid waste programs are a relatively quick and cost-effective method of achieving carbon reduction goals.[1] In addition, the State adopted HB1288, making available grant funds for worthy solid waste projects.

This project is designed to explore the State of Colorado's recycling and diversion situation – including context and performance – compared to a set of other states around the nation. Using these comparisons, we identify "gaps" in programs, and the underlying drivers that may help move recycling forward in the State of Colorado. The project makes recommendations in terms of programs, goals, funding mechanisms, and policy.

1.2 Demographics, Diversion and Program Performance, Comparisons, and Gaps

Initial discussions identified three states for intense comparisons to Colorado – California, Iowa, Oregon. These states had similarities to Colorado, and had initiated different solid waste planning strategies from which Colorado might learn. A tabular comparison of Colorado to three other states is provided. Table 1.1 compares the demographics and leading businesses in the States. Certainly California is larger; however, the leading industries are quite similar between the states. In addition, Chapter 2 provides detailed tables and maps that demonstrate that all four states have significant concentration in population along "corridors", in a manner not dissimilar to Colorado.

Table 1.1. Comparison of Demographics and Industries

	Colorado	California	Iowa	Oregon
Total Population	4.81 million	37.2 million	2.94 million	3.5 million
Incorporated Percent	73%	82%	77%	68%
Average community size	12,900	70,800	2,400	10,100
Number of Incorporated places	271	432	949	240
Major industries	Admin/ support / waste mgmt / remediation; retail trade; accommodation & food; Health care / social; construction.	Retail trade; health and social services; professional & technical; accommodation / food; Admin / support / waste mgmt / remediation.	Manufacturing; retail trade; health & social services; Accommodation / food; Finance & insurance.	Manufacturing, retail trade, health & social services; Accommodation / food; Construction.

[1] City of Fort Collins, as an example.

Table 1.2 compares Colorado's recycling and diversion program penetration and performance to the other states. The table shows that, if the State's goal is to increase diversion, the methods are clear – the state amends the gaps in:

- Curbside recycling
- Drop-off recycling
- Curbside yard waste
- Drop-off yard waste
- Broaden PAYT penetration
- Ensure basic, large value commercial recycling
- Education on diversion / recycling
- Potentially a bottle bill.

Table 1.2. Comparison of Diversion Program Penetration and Performance

Percent of Communities	Colorado	California	Iowa	Oregon
Drop-off Recycling (D/O R)	60-80% said drop-off available; 25%-30% have drop-off only; 40% may have no options for recycling (about 10% of population)	Nearly all	56%	79%
Curbside Recycling (C/S R)	~ 35% of population; 20% of population has C/S service required/paid. 40%-50% of sample towns reported C/S unavailable	88%	69%	94%-98% of incorporated areas.
Drop-off Yard Waste (D/O YW)	~50% occasional**, however, it is not always composted, but landfilled or burned.	90%+ permanent	Nearly all permanent	n/a
Curbside yard waste (C/S YW)	<5%	82%; adding food	n/a	29%
PAYT	<15%	50%	54%	100%
Commercial Programs	Minimal	Advanced / aggressive incl. C&D, audits		Aggressive, including PAYT with embedded recycling in some areas
Source Red'n Programs	Minimal; some master composter training, etc.	Advanced in some areas; zero waste in some		Advanced, including measurement "adders" of 2% toward goal for certain programs
Bans	Half say bans in place	Whole tires, used oil, batteries, white goods, electronics, other	Yard trimmings, whole tires, used oil, lead acid batteries, white goods	Auto, appliances, oil, un-shredded tires, batteries, hazardous from regulated generators
Mandatory garbage service	Close to 30%	Two-thirds reported that collection is mandatory	Mixed (urban tend to require payment)	Rare
Trash service rates	$10-40/mo; avg ~$14/mo	$24.53 average $15.45 min/ $40.28 max	$8-15/mo base; add $5-8 for recycling costs when optional.	$10-21 for30 gal; 13-30 for 60 gal; 13-35 for 90.
Diversion Rate	12.5%	52%	40%	46%
Recycling Rate	10%	n/a	32%	36%
Table notes	*** 50% have occasional collection of limited materials; collected separately, but ultimately landfilled in many cases.*			

In addition, several infrastructure gaps exist. For example, Table 1.3 shows that Colorado has fewer MRFs than other states, and the MRFs that Colorado does have are mostly clustered in the Front Range, hindering diversion efforts elsewhere in the State.

Table 1.3. Comparison of Solid Waste Facilities and Infrastructure

	Colorado	California	Iowa	Oregon
Landfill tipping fees (average, range)	$0-$65/ton; average ~$30/ton (cu yd ranged $0-$12, average $6.75)	$34.10/ton median $85.30 maximum $2.50 minimum	~$33.23 ton	~$35/ton
Number of landfills	72	142	81	28-30 MSW, 4-6 C&D
Landfilled tons	6,932,187	37,764,839	2,187,617	2,685,000
Number of MRFs,	7	58	13	10
Population per MRF	679,000	641,000	226,000	370,000
# Composting facilities	N/A	N/A	8 non-permitted; 16 permitted	44 (2 permitted for food also) (all private)

Various programs can have dramatic impacts on diversion. Introduction of these types of programs would bring immediate effects, as shown in the table below.

Table 1.4 Potential / Estimated Impacts from Key Diversion Programs/Policies/Activities[2]

Activity	Impact	Notes / Discussion
Curbside recycling	10-20+%	Varies based on commodities, collection frequency, containers and collection methods and other factors. Higher with single stream; much less expensive if collected fortnightly but lose some material diversion.
Drop-off recycling	3-10%	Can perform well in rural areas, especially if placed in destination areas like grocery parking lots. Advertising to multifamily buildings can help.[3]
Curbside yard waste	15-25%	Varies based on growing season and cost of program.
Drop-off yard waste	2-10%	Varies based on convenience
PAYT	6% - 17%	PAYT dramatically improves capture from curbside and drop-off yard waste and recycling programs. Leads to significant source reduction / generation avoidance.
Commercial recycling / large value items; possible technical assistance / education	N/a	Impact depends on amount already recycled, business mix, etc.
Education	1-3%[4]	Increasing expenditures on education and public outreach and student programs has a measurable effect on diversion. It is also important for the adoption of any of the other diversion activities.
Bottle bill	TBD	All bottle bills (deposit legislation) are not created equal. Some perform better than others; some certainly have far greater administrative burden than others. There are strengths and weaknesses.
		Source: Skumatz/SERA, 1995, 1999, 2000, 2001, 2002, 2004, 2006, 2007

[2] Skumatz, Lisa A., Ph.D., 1996. "Nationwide Diversion Rate Study - Quantitative Effects of Program Choices on Recycling and Green Waste Diversion: Beyond Case Studies", Skumatz Economic Research Associates, (SERA), Superior, CO; Skumatz, Lisa A., Ph.D. 1999. "Achieving 50% in California: Analysis of Recycling, Diversion, and Cost-Effectiveness", prepared for California Chapters of SWANA, Skumatz Economic Research Associates, Inc. (SERA), Superior, CO, and Skumatz, Lisa A. articles in *Resource Recycling* including 6/99, 8/99, 9/99, 8/00, 6/01, 8/01, 7/02, 8/02, 9/02, 10/02, 8/04, 9/07.

[3] Note, our strategy for Colorado does not focus on multifamily recycling. This has consistently proven to be a more difficult program to implement well, and we believe it is a strong second-round plan of attack, but not first round. It might, for instance, be the focus of a grant round later on.

[4] Source: Skumatz, Lisa A. and John Green, 2001. "Measuring Impacts from Education…", prepared for Iowa Department of Natural Resources, Skumatz Economic Research Associates and Econservation Institute, Superior, CO.

In addition, interviews with Colorado communities identified five specific barriers affecting diversion in the state. They include:

1. Geography and Access: There are two closely related barriers associated with geography and location – the geographic isolation of the entire town and the location and access to drop-offs within the town itself. The geographic isolation of towns in rural parts of the State and associated transportation costs of materials were barriers to their recycling effort. In other areas, the distance and inconvenience for residents to travel to the drop off area was a barrier.

2. Economics: Economics are involved in almost all of the listed barriers. The increased cost of transportation due to location, the cost of providing education materials, the increased cost of the optional curbside service provided by private haulers, the lack of economic incentives to recycle (i.e. a landfill with no tip fee in Otero County or unlimited trash collection for a flat fee) and the lack of funding to start up new programs in the town or city are examples of economic barriers present in Colorado.

3. Lack of Options: The lack of options to recycle was mentioned in a large portion of the interviews as a barrier to recycling. These were towns with either no drop-off options, or ones where drop-off was available but for only a limited number of materials. Lack of options was mentioned by a large portion of towns (40%), however, these towns only contain a small proportion (less than 10%) of the overall State population.

4. Education: Even in towns that have drop-off areas or the option of curbside collection, the interviewees reported that a lack of education among residents was a barrier. The need for education was reported as a means to tell residents how and where to recycle as well as the benefits of recycling and overall sustainability.

5. Multiple Un-Regulated Haulers: Nearly two-thirds of the communities reported that they had multiple haulers collecting trash and/or recycling in their community and 10% of the interviewees said that this was a barrier to diversion. Many use different types of programs, complicating education and services; some offer recycling for extra fees, which discourages participation; and cost efficiencies are sacrificed with multiple haulers serving the same geographic area, hurting the economics of recycling.

1.3 Gaps, Recommendations, and Impacts for Colorado

The analysis of other states indicates that without several key things – consistently identified as legislation, funding, and monitoring – little in terms of program implementation will happen. Thus, in discussing or identifying the "enablers" or drivers, it is not sufficient to stop with saying the state lacks "curbside recycling" – the drivers for that program also need to be discussed.

Table 1.5. Summary of Major "Gaps" in Colorado's Solid Waste and Diversion Situation

Category	Gaps
Demographics, Economics, and Markets	No critical differences in population or industry patterns. However, California and Oregon have access to ports that are not available to Iowa or Colorado. All three other states have greater access to significant industries that can use recycled materials, especially paper; Iowa also noted its rail lines helped deliver product to market.
Facilities, Infrastructure, and Costs	Landfill fees are similar ($30-35/ton), so differences in avoided cost are not the drivers for differences in the presence of recycling and diversion. Household trash bills are also fairly similar; however, unlike Colorado, the bills in the other states generally include recycling.
Policies and Legislation	The states have varying levels of bans; Iowa's bans include yard waste, white goods; all the states ban basic tires, batteries, hazardous materials, etc. The three other states have bottle bills, which several states indicated were important to their strong diversion performance and recycling ethic. Mandatory trash service is less common in Colorado and Oregon than in California and Iowa. Most importantly, all the other states have state-level legislation with diversion goals, and program, policy, or performance requirements for communities and/or landfills in the State, The legislation was a significant "driver" for program adoption across these states.
Recycling Programs, Incentives, and Performance	Colorado lags far behind the other comparison states in both curbside and drop-off recycling access. 40% of communities covering at least 10% of population say no options are available. Curbside recycling is available in about 50% of communities but it is not mandatory and it usually costs extra (not embedded in the trash rates); thus, participation is likely much lower. Colorado also lags behind all three other states in adoption of PAYT, which has served as a strong driver for household diversion.
Yard Waste Access	Yard waste drop-offs and collection programs are rare in Colorado (especially compared to California (where curbside is the norm) and the other states (where drop-off is common). Colorado's programs are often occasional (Holiday trees) and most egregiously, the materials, while collected separately, are often landfilled or burned.
Extended Diversion Efforts	California and Oregon have extensive commercial programs, and both states have actively pursued source reduction efforts in the residential and commercial sectors. Colorado, with only a few notable exceptions (Aspen, Fort Collins, and to some degree, Boulder) has few efforts in the commercial sector, in source reduction or other efforts.
Funding	Tipping fee surcharge mechanisms and associated grants and rebates have been used to help fund planning efforts. Program funding in Oregon is almost exclusively through trash / recycling bills. Program efforts in California are somewhat underwritten by increased taxing authorities granted to communities along with the legislation. Colorado has a limited grant fund available; however, it is not sufficient to support either state-wide planning efforts, or for ongoing programmatic funding.
Conclusion / Recommendation	Recycling did not spontaneously arise in these other states. Legislation and statewide initiatives were key drivers. To move recycling and diversion forward in Colorado, several steps are needed to move recycling and diversion forward in Colorado:[5] • Legislation at the state level to adopt a goal and require planning, education, recommended "best management practices" (including PAYT), reporting, measurement, enforcement, and funding; • OR Encourage adoption of local ordinances that establish a level playing field for all haulers operating in the community or county, requiring access to threshold / defined recycling programs, cost of programs embedded in the trash rates (and potentially PAYT), education, and tonnage reporting. The State might consider encouraging adoption by providing favoritism for grants for those communities implementing such legislation.

[5] The next chapter addresses specific legislation requirements, and also provides information on the types of recycling and diversion program designs that are most cost-effective (once a community or hauler decides to move forward with programs, perhaps at the nudging of local or state-wide legislation).

1.4 Recommendations for Colorado

The analysis leads to the following overarching recommendations to "drive" recycling in the State of Colorado:

- *Introduce state-level legislation with key requirements related to goals, best practices, measurement, enforcement, education, and funding, OR*
- *Help cause local jurisdictions (communities and counties) to adopt local ordinances that require: access to (curbside) recycling; recycling fees embedded in trash rates; PAYT rate structure (preferred); education; and hauler reporting to allow measurement of progress.*
- *A grant program designed to foster sustainable recycling and diversion and overcome recycling barriers in Colorado;*
- *Identify and "lock in" a long term local or state funding source that supports these objectives.*

1.4.1 Elements of Option for State-Level Legislation Recommendation

We compared the array of initiatives in place in three other states, and identified strategies that may represent "best practices" and those most suited to the Colorado situation. Based on these analyses, we developed recommendations consisting of the following main elements:

Responsibilities:

- Establishing a statewide diversion goal of 25%, with lower goals for counties with low population density, and higher goals for higher population density counties.
- Identifying responsible entities (cities / counties) and tasking them with developing comprehensive plans for solid waste management, to be updated every 5 years.
- Responsible entities that are in low density areas must implement 2 of a set of 7 recommended "best practices" specified in the law (see shaded table below); those in high density areas must implement 4 of the programs.
- In lieu of implementing these programs, communities of either size may implement programs of their own design as long as they achieve goals.

Funding:

- Funds are to be raised at the state level from two sources: a fee on first ownership of toxic materials in the state, and an increase in landfill tip fee surcharge on all materials disposed in the state.
- The State uses the funds to 1) reimburse communities for a portion of the comprehensive plan costs; 2) provide grants for drop-off programs in rural areas of the State, and 3) provide grants for other programmatic and infrastructure needs in the State.

Monitoring and Enforcement:

- Communities shall be responsible for reporting tonnages annually to the State, and the State shall post the information on a website for easy access.
- Communities not achieving the goal will need to 1) work with the State to identify reasons for non-compliance, and 2) implement PAYT or, if already present, implement another program from the Best Management Practices list.

Education:

- The State will fund education at the level of $1/household per year for state level education or for a fund for communities to draw their proportion to conduct education and outreach on recycling and diversion.

- The State should sponsor workshops and establish a website geared toward helping communities with sample ordinances, contracts, PAYT materials, peer match to state and other communities with programs of interest, etc.

Summary of "Menu" of Seven Best Practices for Colorado Legislation	
1) Establishment of recycling drop-offs at least 1 per X000 residents collecting at least newspaper, cardboard, HDPE, PET, aluminum cans, glass, steel cans;	5) Effective yard waste program including promotion;
2) Curbside recycling at least fortnightly on same day as trash with container at least 64 gallons, no separate fee, collecting at least newspaper, glass, HDPE, PET, aluminum and steel.	6) Commercial recycling including at least cardboard, office paper;
3) Education program;	7) PAYT or area-wide PAYT ordinance with smallest container no larger than 32 gallons (maybe 21 gallons), requiring 75% incremental rate increase for each level of service (i.e. 1 can, 2 can, 3 can levels of service), and hauler reporting.
4) Collection of at least 4 materials for Multifamily;	

1.4.2 Elements of Recommended Option for Local Level Ordinances to Move Diversion Forward in Colorado[6]

Many (but not all)[7] of the objectives of the state-level recommendations can be achieved in the short run through adoption of local – city and/or county ordinances. The key elements of successful ordinances follow. Important considerations are that the legislation provides a "level playing field" for haulers operating in the area, and the effects are not disrupted if the state later implements recommended strategies state-wide. Key elements include:

- **Define threshold recycling service**: Each household receives 64 gallon or larger container, collected fortnightly or more frequently, and at least 5-7 key materials must be collected: mixed paper, newspaper, cardboard, steel cans, aluminum cans, and potentially glass and #1 and #2 plastics.

- **Recycling embedded in trash fee**: Cost of recycling program should be embedded in the trash fee – no separate or extra charge for recycling.

- **Pay As You Throw (PAYT) rates**: PAYT rates – incentives that charge higher fees for collection of larger volumes of trash from the household – should be specified, and the rates should be structured to present households with a combined total bill that is at least 80% higher for double the trash service (2 cans vs. 1 can, etc.).

- **Education**: Education, on at least an annual basis, should be required, along with a "move in" packet.

- **Reporting**: Ordinances should specify that all haulers must provide estimates of residential recycling and residential trash tonnage on a quarterly basis to the community.

In order to "encourage" adoption of ordinances of this nature, the State may consider:
- Widely publicizing ordinances and impacts,
- Offering workshops and/or technical assistance and websites on strategies,
- Providing preferences for grants (HB1288 or other grants) in communities that have passed ordinances, or other strategies.

[6] Examples of these types of ordinances are available from Fort Collins, Boulder, Boulder County, Aspen, Loveland, Superior, and others. Several of these ordinances are posted on SERA's website "www.paytwest.org", a project funded by EPA Region 8 that is designed to encourage adoption of PAYT in communities in Colorado by offering free consulting and free workshops on PAYT.

[7] For example, funding flexibility and sources are limited at the local level.

A detailed recitation of these recommendations is provided in the final chapter, before the appendices. Almost all of these state-level elements are in place in other states, and the local ordinance elements are in place in communities in Colorado.

1.4.3 Grant Program and Funding to Address Barriers

Several of the states that were interviewed had successfully overseen grant programs aimed at addressing the barriers to diversion in their own States. The interviews provided several elements of successful grant programs:

- Grants should be used to address barriers, but should not generally lock the agency into long-term subsidization of a program that will not be sustainable over its lifespan.[8]
- Market development grants should be geared toward the following roles: new product testing (to assure a product is fit for purpose if they incorporate recycled content); serving as a facilitator / information source, helping identify sufficient source of recovered materials for a project to move forward; providing lists of firms making products with recycled content; providing sample procurement guidelines and/or bidder's lists for communities; or providing limited term incentives that help encourage use of (local) recycled content products, helping firms that have invested real funds in a product with a real potential market.[9]
- A long-term, sustainable source of funding should be identified in support of these efforts. With a long-term grant program, the program will be around for various generations of efforts in the State. Some programs will be ready fairly soon; others may take 2-5 years to become "ripe". A program that allows all jurisdictions that are paying into the fund to believe they may see something out of it can prove a powerful motivator. Most states used some version of a landfill surcharge, which helps recognize that both landfilling and diversion are part of the same overall solid waste management system.[10]

Although recycling can and will evolve without some involvement in grant programs that address barriers or increase opportunities to use the materials in the marketplace, well-designed actions can help speed the process.

There are specific suggestions related to barriers identified in the State of Colorado. A number of possible solutions are presented in the conclusions of the report to address the real and perceived barriers to diversion in Colorado that were uncovered during the research and interview process. A summary of these responses is presented in the table below.

[8] However, some transfer to close-to-supportable rural areas may make sense to broaden accessibility to recycling in a very dichotomous state (very urban along a corridor vs. very rural elsewhere) – especially given the low investment needed for some of these programs. Depending on the funding source, this may qualify as redistribution.

[9] One example of this harkens from Colorado a few years ago. The State offered grants that matched 75% of the cost of purchasing recycled content products – for instance, parking stops that used recycled tires – for non-profits, schools, or municipalities. In this way, the grant helped move an existing product into greater demand and potentially moved the firm toward economies of scale, and a "product" transferred.

[10] Despite 20 years of concern that this funding method would be a decreasing source of funds – a "death spiral" as disposed tonnages decreased and recycling increased – no programs to date have experienced this outcome. A few states added specific local taxing authorities, one interesting option taxed the first owner of toxic sales within the state, and another may have used lottery funds.

Table 1.6: Possible Responses to CO Specific Barriers

Barrier	Solution
Geography and Access	Grant funding to support non-profit cooperatives for rural areas where it does not exist. Support of expanded and new drop-off areas, with possible limited hours to allow for staffing when open.
Economics	Colorado has taken the first step to address this barrier with HB 1288. Additional sources of funding are suggested in the report.
Lack of Options	Determine what percent of population does not have access to recycling and look to provide options to them. Various mechanisms to increase options statewide include legislation, mandates, PAYT, support of non-profits, and funding for more and expanded drop-off areas.
Education	Support education programs both statewide and locally. School-age and bi-lingual education important.
Multiple Un-Regulated Haulers	Use the models of Fort Collins, Boulder, Portland OR, and other areas to work with haulers, citizens, and communities to provide recycling choices and the opportunity for profits by private haulers.

It is important to note the recommendation to support programs that have long-term sustainability and community investment. Together these two caveats point to the advantage of supporting the non-profit recyclers in the rural areas of the State, many of which have been operating for years with high rates of success, and already have a large investment in recycling. Another potential solution with a proven track record of long-term success and effectiveness is Pay-As-You-Throw. PAYT programs have been shown to increase diversion on the order of 16%-17% and are in place in over 7,000 communities in the US[11].

1.4.4 Impacts – Including Jobs

Should either of these recommendations (state-level or local ordinance approach) be implemented, we anticipate that the State will be able to achieve a 25% diversion level in the first phase, and 33% in the second phase – and, in the first phase, divert 1.5 million tons of trash annually across the State. The economic and job development impacts of these initiatives are provided in Table 1.7.

Table 1.7 Economic Impacts of Recommended Solid Waste Initiatives

Increment beyond BASE Landfilling	Direct	Indirect	Induced	Total
Current case - Colorado output	$ 362.9	$ 131.0	$ 131.8	$ 625.7
Current Case - Colorado Jobs	1397	671	1078	3152
25% diversion Scenario - output	$ 113.1	$ 31.8	$ 32.3	$ 177.3
25% diversion Scenario - jobs	428	240	264	932
Net tons per year diverted from landfilling				1.5 million tpy
Figures in Millions of $ for Output, jobs presented in total number				

1.4.5 Summary

Getting these changes made at the state level will take a concerted effort. This includes:

- Assembling coalitions behind the legislative elements, including funding initiatives
- Enhancing the technical assistance functions of CDPHE, to develop informational materials and web sites to work with rural and other community staff in implementing program changes

[11] Skumatz, Lisa A. Ph.D., and David J. Freeman, 2006. "2006 Update on PAYT Nationwide…", Skumatz Economic Research Associates, Inc. Superior, CO; Available on EPA website.

- Establishing the baseline measurement protocols, and installing appropriate tracking software

However, the outcome of these efforts will include:

- Increasing recycling access to residents and businesses across the State
- Recognition that some areas of the State have more favorable economic and other situations relative to recycling;
- Increasing the State's diversion level to 25%, and ultimately, beyond 30%, moving Colorado to the top 40-45% of states in terms of diversion performance.
- Effective method of helping contribute to the Governor's climate change goals.

The remainder of the report expands on these topics, providing detailed analyses of gaps, program options, and recommendations.

- Chapter 2 provides a brief snapshot of the economics and demographics among the selected comparison states.
- Chapter 3 summarizes diversion programs, performance, and legislation in each of the four states, as well as information from a few additional states that help inform options for Colorado;
- Chapter 4 discusses barriers, drivers, and enablers in each state, and provides recommendations for Colorado;
- Chapter 5 includes an appendix related to economic development estimates, and diversion measurement options.

2.0 STATISTICS ON DEMOGRAPHICS & ECONOMICS IN COLORADO AND THREE COMPARISON STATES

2.1 Introduction

The project required selection of three states (including California) that would serve as the focus of research and comparison. After discussions, California, Iowa, and Oregon were selected as comparison states because of both similarities and differences – and because each, in its own way, has taken different paths toward becoming leaders in solid waste planning. The first step of the project was to provide comparisons to Colorado on an array of demographic and economic indicators. Discussions led to the selection of the states of Iowa and Oregon. The graphs include:

- Share of firms in various industries for each state (including stacked bar chart and input data)
- Share of employment in various industries for each state (including stacked bar chart and input data)
- Computed employees per firm by industry for the four states
- Demographic data including population, density, income, education, and similar demographic indicators
- Population density maps for each of the states.

These elements are included in the following sections. The final section of the chapter provides a summary of the results.

2.2 Demographics and Leading Industries

The following figures create a side-by-side comparison of the economic and demographic data for Colorado, California, Iowa and Oregon. The figures are presented with the data for all four states allowing the reader to draw visual and numerical comparisons of the data. An analysis and comparison of the data is provided in the following section. Both the first figure and table display the total number of firms in each state by NAICS code and the computed percent of firms in each state. The following stacked bar figure and table contain information on the number of employees per firm in each of the four states. The final figures in this section show the demographic population density and distribution for Colorado and the other states researched.

Figure 2.1: Total Number of Firms in Four States

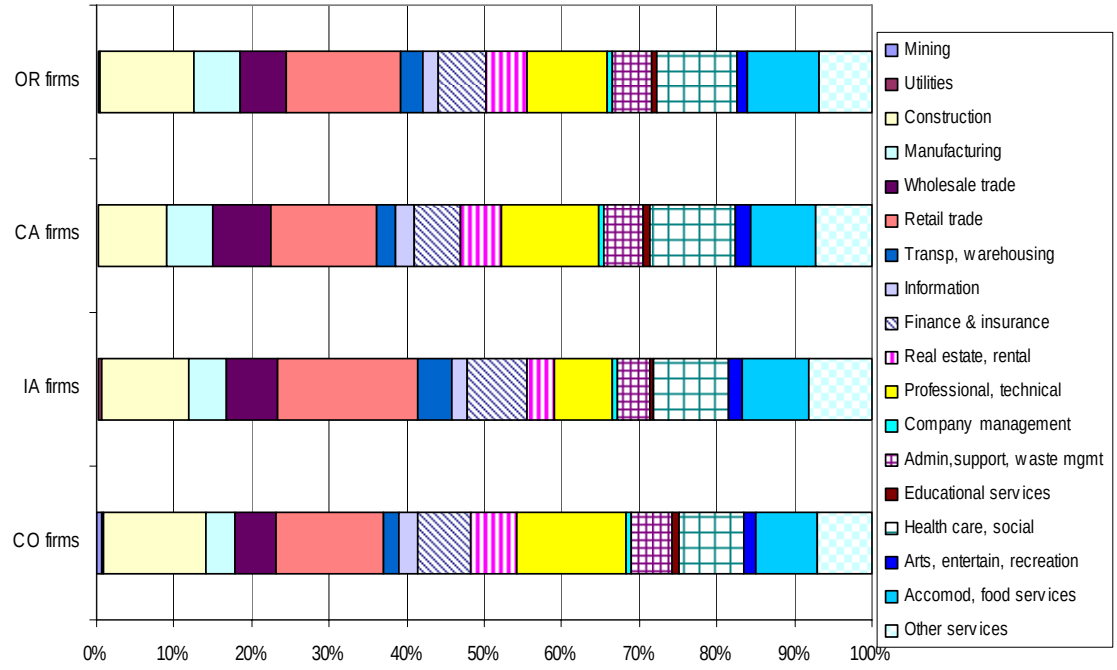


Table 2.1: Total Number of Firms in Four States

	Total Number of Firms by Industry				Percent of Firms by Industry			
	CO firms	IA firms	CA firms	OR firms	CO firms	IA firms	CA firms	OR firms
Mining	950	208	871	152	0.7%	0.3%	0.1%	0.2%
Utilities	396	330	1,144	219	0.3%	0.4%	0.1%	0.2%
Construction	17,998	8,538	69,023	11,854	13.1%	11.1%	8.7%	12.3%
Manufacturing	5,349	3,804	48,478	5,597	3.9%	5.0%	6.1%	5.8%
Wholesale trade	7,339	4,926	58,770	5,770	5.3%	6.4%	7.4%	6.0%
Retail trade	18,851	13,859	108,941	14,277	13.7%	18.1%	13.7%	14.8%
Transp, warehousing	3,017	3,452	19,012	2,846	2.2%	4.5%	2.4%	2.9%
Information	3,200	1,567	20,484	1,869	2.3%	2.0%	2.6%	1.9%
Finance & insurance	9,371	5,795	45,981	5,914	6.8%	7.6%	5.8%	6.1%
Real estate, rental	8,331	2,730	42,315	5,051	6.0%	3.6%	5.3%	5.2%
Professional, technical	19,417	5,798	100,284	10,141	14.1%	7.6%	12.6%	10.5%
Company management	893	472	4,757	594	0.6%	0.6%	0.6%	0.6%
Admin,support, waste mgmt	7,235	3,204	40,740	4,760	5.2%	4.2%	5.1%	4.9%
Educational services	1,278	349	6,706	739	0.9%	0.5%	0.8%	0.8%
Health care, social	11,629	7,330	88,249	9,975	8.4%	9.6%	11.1%	10.3%
Arts, entertain, recreation	2,110	1,347	16,453	1,404	1.5%	1.8%	2.1%	1.5%
Accomod, food services	10,799	6,586	66,568	8,816	7.8%	8.6%	8.4%	9.1%
Other services	9,742	6,299	57,177	6,611	7.1%	8.2%	7.2%	6.8%
TOTAL	137,905	76,594	795,953	96,589	100.0%	100.0%	100.0%	100.0%

Source: 2002 Economic Census- Summary Statistics by 2002 NAICS

Figure 2.2: Employment per Industry in Four States

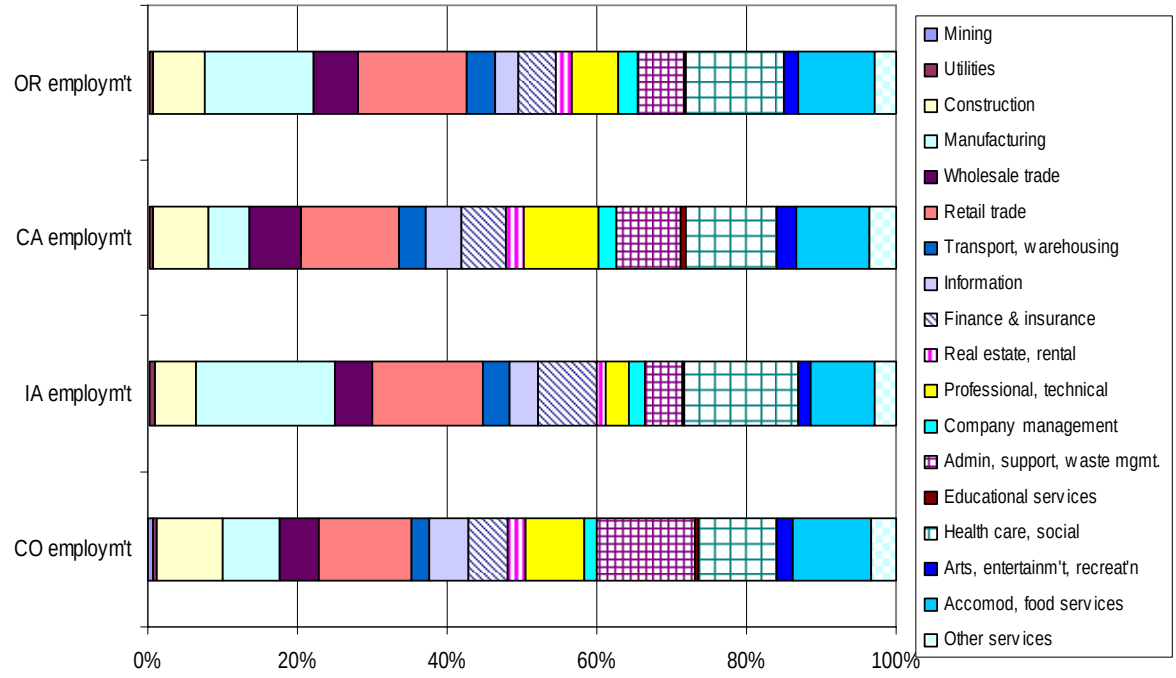


Table 2.2: Employment totals per Industry in Four States

	Employment Totals by Industry				Percent Employment by Industry			
	CO employm't	IA employm't	CA employm't	OR employm't	CO employm't	IA employm't	CA employm't	OR employm't
Mining	13,448	2,005	20,321	1,616	0.7%	0.2%	0.2%	0.1%
Utilities	8,503	8,127	57,461	8,381	0.4%	0.7%	0.5%	0.7%
Construction	175,302	67,213	870,334	87,977	8.9%	5.6%	7.5%	6.9%
Manufacturing	148,842	222,968	616,504	184,151	7.6%	18.5%	5.3%	14.5%
Wholesale trade	101,108	62,023	811,344	74,594	5.1%	5.2%	7.0%	5.9%
Retail trade	247,264	176,251	1,525,113	183,706	12.6%	14.6%	13.1%	14.5%
Transport, warehousing	47,296	43,765	397,266	48,943	2.4%	3.6%	3.4%	3.9%
Information	102,169	44,210	563,841	39,918	5.2%	3.7%	4.9%	3.1%
Finance & insurance	101,856	95,040	681,626	64,366	5.2%	7.9%	5.9%	5.1%
Real estate, rental	47,073	13,651	273,899	26,684	2.4%	1.1%	2.4%	2.1%
Professional, technical	155,868	37,820	1,164,306	77,515	7.9%	3.1%	10.0%	6.1%
Company management	31,502	27,334	267,738	32,417	1.6%	2.3%	2.3%	2.6%
Admin, support, waste mgmt.	258,614	59,289	1,013,925	79,251	13.2%	4.9%	8.7%	6.2%
Educational services	9,360	3,408	62,843	4,628	0.5%	0.3%	0.5%	0.4%
Health care, social	202,409	181,388	1,434,479	165,787	10.3%	15.1%	12.4%	13.1%
Arts, entertainm't, recreat'n	45,265	20,440	287,157	22,441	2.3%	1.7%	2.5%	1.8%
Accomod, food services	206,597	104,638	1,145,536	130,010	10.5%	8.7%	9.9%	10.2%
Other services	64,100	33,724	405,030	37,632	3.3%	2.8%	3.5%	3.0%
TOTAL	1,966,576	1,203,294	11,598,723	1,270,017	100.0%	100.0%	100.0%	100.0%

Source: 2002 Economic Census- Summary Statistics by 2002 NAICS

Table 2.3: Demographic Data

	Demographic Data by State			
	CO	IA	CA	OR
Population	4,753,377	2,982,085	36,457,549	3,700,758
Square miles	103,718	55,869	155,959	95,997
Pop. Density (persons per sq.mi.)	41.5	52.4	217.2	35.6
Wholesale sales ($)	92,092,155	33,546,948	655,954,708	56,855,958
Household income ($)	50,105	42,865	49,894	42,568
Advanced education (%)	32.7	21.2	26.6	25.1
HighSchool Graduate (%)	86.9	86.1	76.8	85.1
Below Poverty (%)	10.2	10.5	13.2	12.9
Second language (%)	15.1	5.8	39.5	12.1
Home ownership (%)	67.3	72.3	56.9	64.3

Source: Maps from Wikipedia; Data for table from Census.

Figure 2.4: Colorado Density

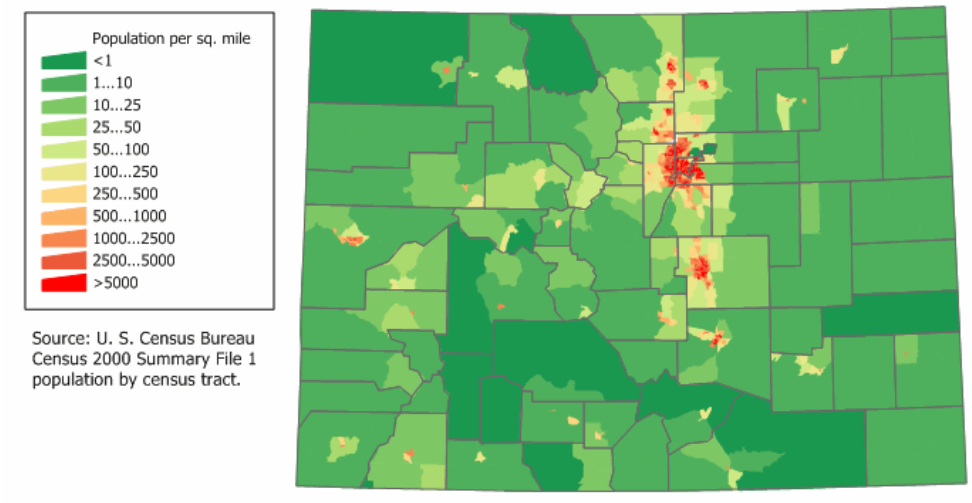


Figure 2.5: California Density

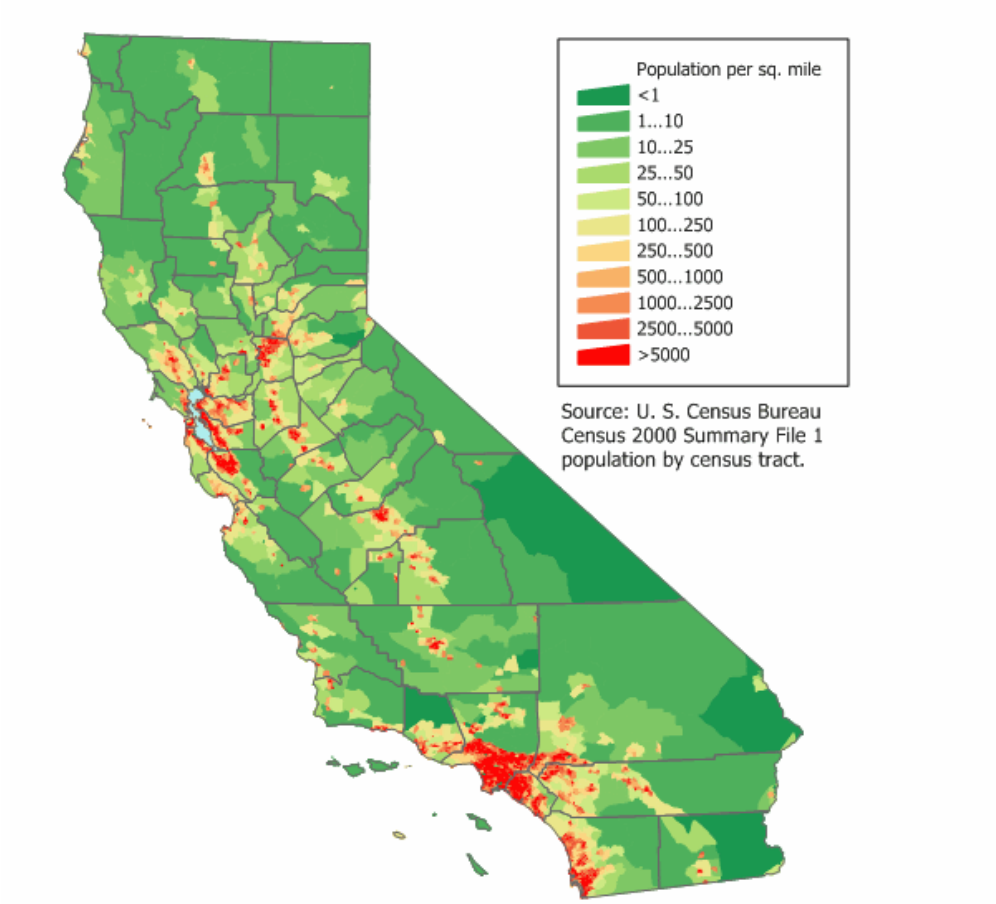


Figure 2.6: Iowa Population Density

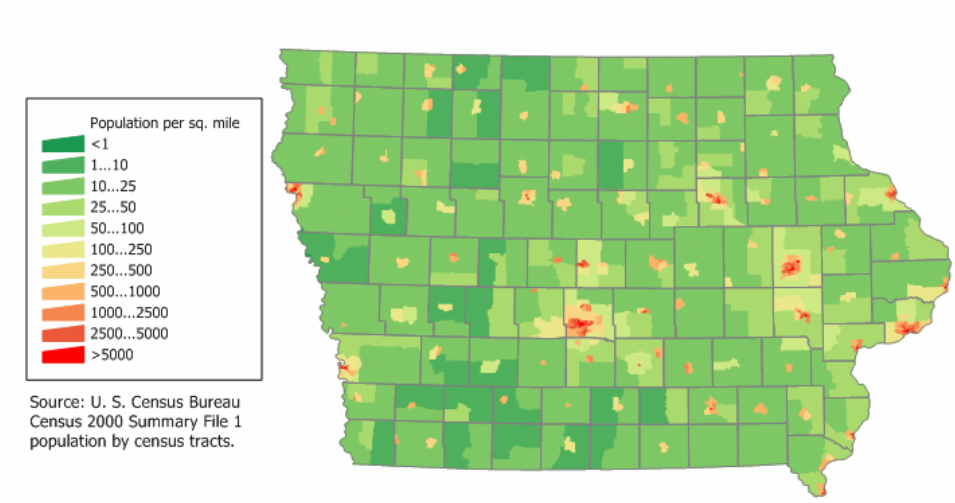
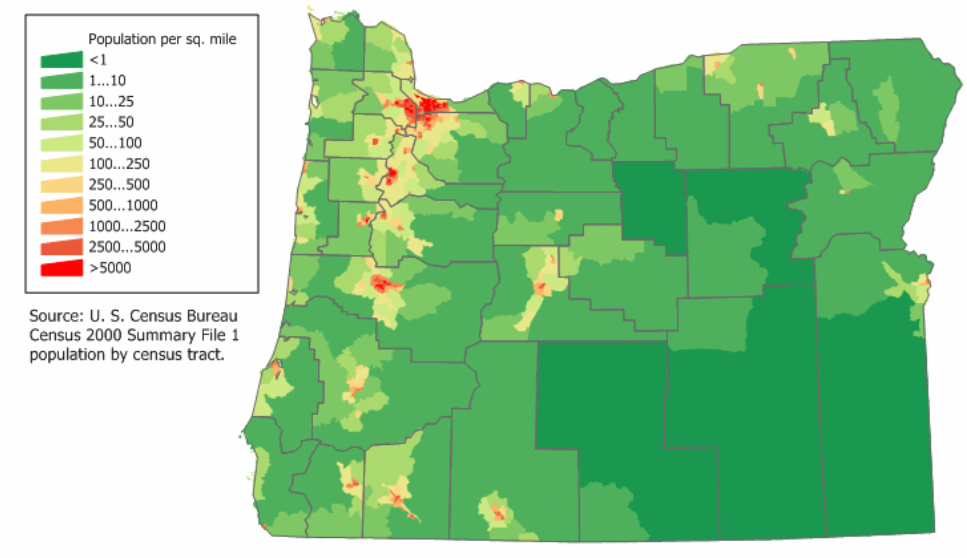


Figure 2.7: Oregon Population Density



2.3 Summary and Conclusions

The figures make the following points for the other states in comparison to Colorado:

- California is 6 times larger than Colorado in employment and firms, and has more than 7 times the population. The population density is five times the density of Colorado's. In square miles, California is only about 50% larger than Colorado.

- The information on industries (firms and employment) demonstrates that, while differences exist, the states do not differ fundamentally in distribution of industries (the stacked bars are not dramatically shifted, or missing key industries, etc.). There is more manufacturing in Oregon and Iowa than in Colorado, and more high-tech / information technology in California, and lower employment in professional / technical in Iowa. However, in general, the mix of businesses is comparable to Colorado. This holds true for both employment and firms. The data and the sets of bars representing employees per firm for the industries in the four states also show relatively similar results (with a few "outliers"). California apparently has larger utilities, construction, transportation, and "professional" firms (interestingly not entertainment), and much smaller manufacturing firms than the other states. Colorado has larger entertainment and administration / support firms than the others. The health care industry tends to be concentrated in larger firms in Iowa. In general, however, the variations are not large, and the states have general similarities (especially Colorado, Iowa, and Oregon).

- California has more "English as a second language" households than the other states (Iowa has the least). Household incomes in Colorado and California are similar; those in Oregon and Iowa are considerably lower. High school graduation rates are particularly similar for Colorado, Iowa, and Oregon. So are population densities, home ownership proportions, and percentages below poverty.

- The population density maps show some patterns. There are more sparsely populated areas (<1 person per square mile) in Colorado than in California or Iowa; however, Oregon has larger sparsely populated areas than even Colorado (mountains play a role as they likely do in Colorado). In each state, the populations are concentrated in clearly-identified metropolitan areas, again, with Oregon and Colorado as most similar. Both Iowa and California have densities spread in several areas of the state, while Colorado and Oregon show a "corridor" of population with little density beyond these areas.

Geographically, economically, and demographically, these states bear useful similarities to Colorado. In addition, the following chapters demonstrate that each of these states has information to provide to Colorado on legislation, policies, and programs that can help move recycling and diversion forward.

3.0 EXISTING DIVERSION AND PROGRAMS BY STATE

3.1 Introduction

This chapter provides a summary of the diversion and situation in the four states – the three selected comparison states, and then Colorado, each described in turn. This chapter gathered information from a combination of interviews, surveys, and secondary sources. Each section includes information on:

- Review of key economic and demographic information for the State;
- Overview of garbage and recycling situation in the State;
- Status of programs in communities; and
- Results of interviews with state and local officials regarding drivers, legislation, funding, measurement and enforcement, impacts, and strengths / weaknesses of the recycling situation in the State.

3.2 California Status Quo

3.2.1 Overview

Demographics

According to the US Census Bureau's 2006 American Community Survey there is estimated to be 37.2 million residents in CA. There are nearly 13.17 million housing units in the state and the median home value in California hovers right around $82,500 dollars. The median family income is $535,700 and the per capita income is $26,974. In California, 82% of the residents live in incorporated areas. The average town size is 70,800 residents. The largest city in the State is Los Angeles, with a population of 3.8 million.

Economics

The 2002 U.S. Census Bureau's Economic Census provides insights into the employment in the State. The three largest sectors of employment by number of paid employees are listed in the following table.[12]

Table 3.1: Major California Industries

NAICS Description	Paid Employees
Retail Trade	1,525,113
Health Care and Social Assistance	1,434,479
Professional, Technical	1,164,306

[12] Chapter 2 provided a summary of firms and employment in many industries.

Garbage

In 2006 California generated 54,995,884 tons of municipal solid waste (MSW), landfilled 32.4 million tons, recycled 17.6 million tons, composted 4.3 million tons, and sent 831,000 tons of materials to Waste-to-Energy facilities (WTEs)[13]. The diversion rate in California in 2006 was 40%. This is higher than the nation wide average of 28.5%[14]. The per capita recycled tonnage in is 0.472 tons/person/year and the disposal rate is 0.870 tons/person/year.

Table 3.2: California Waste Generation and Diversion

Material	Estimated Tonnage	Estimated Rate
Total Generation	85,200,000	100%
Landfilled	37,764,800	44%
Recycled	43,200,000	52%
Waste to Energy	573,800	<1%
Total Diversion	43,773,800	52%

California Material Recovery Facilities

California has 58 different Materials Recovery Facilities (MRFs). Compared to the rest of the country, California is well above the average of 11 MRFs per state[15]. Nationwide, there is a MRF for every 540,000 people, and in California, there is a MRF for every 641,000 people. MRFs in California are heavily distributed in an around urban areas in Northern and Southern California, and a few are located in less populated areas.

3.2.2 Literature Review

The State of California's CIWMB tracks and maintains information on community programs and performance, located at http://www.ciwmb.ca.gov/. This source was reviewed and used in the completion of the work for this project. In addition, we reviewed a detailed evaluation of the State's AB939 legislation.[16]

3.2.3 Community Programs and Performance

To gather more detailed information about solid waste collection, landfill rates, current availability of recycling programs, and the occurrence of other diversion activities in the State, the SERA researchers completed interviews with a random sample of 41 communities in the State. The team completed interviews with 80% of the sample. The surveys covered over 9.5% of the communities in the State. The research consisted of web search followed by phone interviews to complete the data collection of key elements. The results of a small random survey

[13] Generation and diversion data from California Integrated Waste Management Board (CIWMB). www.ciwmb.ca.gov/profiles/statewide/SWProfile1.asp

[14] *The State of Garbage in America,* Bio-Cycle. Volume 47, Number 4. April 2006

[15] Berenyi, Eileen Brettler. *Materials Recycling and Processing in the United States Yearbook and Directory, Fifth Edition*. 2007-2008. Westport, CT: Government Advisory Associates Inc. ©2007

[16] Skumatz, Lisa A., Ph.D., 1999. "Achieving 50% in California…", prepared for California Chapters of SWANA, Skumatz Economic Research Associates, Inc., Superior, CO.

cannot always well-represent the true statewide averages; thus, the random survey data are augmented with some statewide information, where available.

Interviewees

Most towns in California have dedicated recycling coordinators. The average size of the interviewed communities was 53,500 and the median was 30,400. The majority of the communities interviewed, 78%, had populations greater than 10,000 residents while only 7% had populations under 1,000.

Garbage Collection

Although about 29% of the communities interviewed in California reported the use of some sort of Pay-As-You-Throw (PAYT) rate structure, the statewide average is 50% with PAYT (and likely even a larger percentage of the population than 50%).[17] Based on the interviews, garbage service costs Californians about $24.50 per month, on average. A little over half of the communities interviewed reported that garbage service is mandatory. Garbage is collected by the city or county 14% of communities interviewed. The table below summarizes these data.

Table 3.3: California Waste Collection Practices

Type of Collection	Estimated Percent of Communities
One hauler via Contract	47%
Franchised Hauler Collects	33%
City or County Collects	14%
One Private Hauler Collects	3%
Multiple Private Haulers	3%
Pay-As-You-Throw	29% in interviews; 50% from statewide inventory
Mandatory Garbage Service	51%

Recycling Collection and Availability

More than 80% of communities in California have access to curbside recycling programs, and drop-off programs are widely available. Estimates indicate that single stream recycling programs may be in place in about two-thirds of California communities. Curbside recycling costs were reported as embedded in garbage bills by 77% of Californian communities interviewed.[18] Nearly all curbside recycling programs were reported as run by private or franchised haulers. The table below summarizes these data.

Table 3.4: California Recycling Program Attributes

Recycling Program Attributes	Estimated Percent of Communities
Curbside Recycling	83% - 88%
Single Stream	66%
Recycling Costs Embedded	77%
Drop Off Recycling	50%+ (likely nearly 100%)
City Collects	3%; franchised haulers are commonplace in the State

[17] Skumatz, Lisa A. Ph.D., and David J. Freeman, 2006. "2006 Update on PAYT Nationwide…", Skumatz Economic Research Associates, Inc. Superior, CO; Available on EPA website.

[18] Several others are "line-itemed" but not optional.

Yard-Waste Program

Curbside yard-waste programs are provided to approximately 73% of communities interviewed, although state sources imply that figure may be as high as 90% or more. The survey implies that drop off programs are provided to 32% of communities interviewed; however, other information implies these programs may be in place in as many as 90% of communities in California.

Other Programs

California is the place where the recent innovations in construction and demolition (C&D) programs started. The best known programs take the form of a required financial deposit[19] left with the City when obtaining a building or demolition permit. If 50% of the materials generated in the work are diverted from the landfill, then the deposit (or the bulk thereof) is returned. The 50% figure may be met by delivering the waste to one of the "city-certified" C&D recovery facilities (as in San Jose) or through weight slips.

In addition, San Francisco and other communities in the State have implemented aggressive food waste programs, well-represented by the City's "Fantastic Three" program for residences. There is also an active commercial food waste program in the City. San Francisco, Alameda County, and others have active business waste audit and technical assistance programs designed around both paper and office waste, as well as compostables.

As another example of the innovations taking place in the State, the Alameda Source Reduction and Recycling Board, now Alameda $topWaste, has implemented aggressive programs in source reduction. This includes hands-on work with commercial businesses in the County to adopt and integrate source reduction practices into the workplace, including strategies in manufacturing, offices, transport, and other activities. $topWaste has an active program reaching out to businesses to publicize potential successful strategies, designed to the business types that exist within the County. The program fits into their broader climate protection work and goals.

The final example of the innovations being implemented in California is the move to establishing zero waste goals and zero waste programs in the State. California likely leads the nation in this area.

California also has a number of bans on material disposal in local landfills including: lights batteries and electronics, mercury containing items, household and landscape chemicals, building materials, automobile related fluids, tires, and other items such as PCBs and needles.

[19] The dollar value of the deposit is computed using a formula that multiplies the square footage of the facility by different factors depending on whether it is new construction vs. remodel, and single family vs. multi family vs. commercial development. In addition, for practical reasons, the smallest 25% of jobs are exempted from the program because they represent 25% of the paperwork, but only about 10% of the waste. San Jose's program is a good and early example of this program. Note that an unintended consequence of this program is that a considerable share of the funds have remained unclaimed. That implies that the financial incentive may be too low to modify the bulk of behavior, and the costs are merely being passed along to building owners.

Tip Fees

Tip fees in the State range from about $2.50 and $85.30/ton, and the median tip fee is about $34/ton.

3.2.4 Interviews with State Officials and Others

As can be seen by the description above, California has realized exceptionally strong recycling levels. SERA staff interviewed representatives from California cities and counties, as well as national experts to identify key "drivers" that moved recycling forward in the State, how key legislation worked, and the strengths and weaknesses of the situation and recycling / diversion in the State. Key factors leading to increased recycling in the State were:

- Legislation, including the AB939 and the bottle bill,
- Funds to support program planning

Feedback implies that the diversion impacts of AB939 have been positive, and many cities and counties that would have done nothing were motivated by the funding to undertake an array of efforts. The funding got the attention of Public Works Departments that otherwise wouldn't have undertaken such aggressive program efforts.

Feedback on the State's bottle bill is more mixed; it has diverted material and provided access to recycling[20], but it reportedly involves a cumbersome and expensive administration system.

Recycling Enablers and Elements of Relevant Legislation

Recycling drivers were cited as the bottle bill, AB939, and funding. California's AB939 is well-known nationally as one of the few pieces of statewide solid waste legislation that has an associated financial penalty for non-compliance or non-performance. This legislation, established in 1989,[21] imposed mandates on cities and counties of 25% recycling by the year 1995, increasing to 50% by the year 2000. The legislation also laid out reporting requirements, measurement methodologies, and penalties. The reporting system is based on changes in landfill tonnage from a baseline year, and is not based on measuring tonnage diverted by individual programs. The program also authorized cities and counties to institute special fees or charges for planning and programs. Finally, the legislation states that non-compliance triggers a fine of $10,000 per day.[22]

Proposing mandates with penalties is not popular. In fact, California is the only state with such a direct penalty structure. The factors leading to its passage in such a form was cited as "the stars must have been aligned."[23]

[20] According to the CA Beverage Container Recycling and Litter Reduction Act "there shall be at least one certified recycling center or location within every convenience zone" and the Act sets minimum operating hours for the recycling center.

[21] Prior to this legislation, the only requirements were that counties had to conduct a solid waste management plan recounting how they would manage waste for 15 years (to avoid state crises). This had to be passed by the county board of supervisors and by a majority of the population – a double majority – and was supposed to be updated every 5 years, but in reality was updated most commonly when a permit was needed. Progress increased dramatically when AB939 was introduced.

[22] Cities or JPA or the responsible planning entities are responsible for the fine, and after several years allowing "best efforts" and progress, several fines are working their way through the system.

[23] One interviewee implied that the State's League of Cities was opposed, which would ordinarily have significantly hurt chances of passage.

It was difficult for the interviewees to recall the "enablers" and coalitions that were involved in the passage of the legislation, because it had been quite a long time ago. However, those mentioned included:

- Environmental groups;
- League of cities (they had to be "for it" or it wouldn't pass, and their focus was it would be do-able and tools available to comply);
- Lawyers for the large haulers had to be neutral (and they could potentially experience business opportunities from the legislation).
- Key actors "missing from the table" that might have been helpful could have been manufacturers/end-users, MRF owners, firms that make packaging and products, and others.[24]

Funding

The legislation provided the authority for local jurisdictions to impose fees to pay for the cost of compliance. Several different kinds of fees are associated with the legislation.[25]

- Local Jurisdictions: A fee for jurisdictions with facilities within their boundaries, which may impose a fee on tonnages at facilities.
- Local Jurisdictions: A fee for jurisdictions without facilities within their geographic boundaries, which may impose fees on franchised collection.[26]
- State: The state collects a $1.40 per ton fee on all landfilled tons statewide to fund the California Integrated Waste Management Board (CIWMB) and that portion of the state water board that deals with solid waste facilities.

Required Measurement Methodology

Solid waste management planning and monitoring have been required in California since 1989.[27],[28] The process began when the State required each jurisdiction to conduct a waste characterization study, calculate an initial diversion rate, and prepare a Source Reduction and Recycling Element (SRRE) that described how the jurisdiction would reach the State's targets of 25% diversion by 1995 and 50% diversion by year 2000.[29] Once a jurisdiction's SRRE was approved, it was required to submit annual reports to the California Integrated Waste Management Board (CIWMB). Thus, some jurisdictions have been submitting annual reports for close to 15 years. During this time, the reporting process has evolved some, but continues to be based on the same general diversion rate formula.

The CIWMB specifies the contents of the annual reports, but not their format. The CIWMB does, however, provide a model report that jurisdictions can use and submit electronically. To help with reporting, the CIWMB provides extensive information on its website, under the section

[24] Target stores were mentioned as a type of firm that could potentially be pulled in to testify about what they've done and show it is do-able and good business.

[25] An alternative set-up for the fees could have been a state-collected fee that was rebated back to communities; however, some communities were pleased that they had direct collection of fees. Another suggestion was that the system could have been set up with the State Board of Equalization, which collects the sales tax and has the right to audit, etc. Instead, the CIWMB authority was created.

[26] A weakness associated with this fee authority is that no fees are received for self-haul tonnages.

[27] We include a significant discussion of California's measurement methodology because 1) it is an early method, with much attention paid, and 2) it has spread to other states.

[28] This section draws on research conducted in Skumatz, Lisa A., Ph.D., and David J. Freeman, 2007. "Measuring Success in Solid Waste…", SERA Research Paper, Skumatz Economic Research Associates, Inc., July 2007.

[29] This is a simplified description of the process!

called “Local Government Central” (www.ciwmb.ca.gov/LGCentral). The site includes, for example, the model report, a diversion rate measurement calculator, waste characterization data, per capita disposal rates, and disposal rates by business types (e.g., tons disposed per restaurant employee per year). The CIWMB cautions that some of the information is provided for planning purposes only and should not be used as measurement tools.

Methodology: California uses a landfill diversion measurement method, and calculates diversion in tons as follows:

Diversion = Generation - Disposal

The method for calculating diversion for the base year is somewhat different than for subsequent years.[30]

Disposal: Initially and subsequently, disposal is based on actual facility records, and includes both landfilled and exported material. The robustness of this figure depends on the availability, reliability, and completeness of facility records.

Generation: For the base year, generation is the most elusive figure. It is usually a combination of reported and modeled data. After the base year, the generation rate is adjusted annually using changes in population, employment, and inflation-adjusted taxable sales growth. This rate can also be adjusted for unusual events, such as major disasters, and for imports.

Diversion: Diversion is then the difference between generation and disposal. Once generation and disposal tons are determined, diversion can also be expressed as a percentage. For instance, the State diversion rate for 2004 was 100% - 52% = 48%.

Recently, the CIWMB has looked more and more closely at the demographic and economic factors used to adjust generation rates in order to identify relevant trends. For example, in recent years construction employment in the state has grown far faster than average employment. This additional information has provided useful guidance for program planning.

As described, the State's AB939-defined "diversion goal" is defined as a percentage of overall disposal (adjusted for basic demographic and economic factors) compared to a base year. The State's measurement method provides an important measure of progress in the State, and has several key strengths:

- It represents an attempt to measure progress from all recycling and waste minimization efforts, including source reduction,
- the measure makes specific accommodations for economic growth and demographic changes, and
- the method incorporates progress across all generator sectors.

However, our analysis found several significant difficulties[31] in using this measure alone in attempting to examine statewide progress and the effectiveness of specific program efforts.[32]

[30] Note, there is an option for jurisdictions to calculate diversion by tallying records and estimates for various source reduction and recycling activities. However, when the reporting requirements were first adopted, few jurisdictions had extensive recycling programs in place, and thus chose to use the method described above.

[31] Over time, some suggest that California’s method has also proven more accurate for large jurisdictions than for small. Rural and small jurisdictions are more sensitive to single changes in the waste stream. For example, several large self-haul loads to the landfill will be felt more in the numbers for a small jurisdiction than for a large one.

- **base year data problems:** Communities reported that inaccurate base year data led to problems including misleading or "negative" computed diversion. This was particularly a problem in communities with more recent installation of scales, or communities with difficulty tracking self-haul tonnage.

- **computational difficulties:** Because the computation compares to a base year, communities with recycling or diversion programs that were established prior to the base year do not receive credit or meet the goals, even if their programs exceed those in other communities. Some communities report that the "corrections" for economics were insufficient, as some reported "meeting" the goal without implementing programs (some cited military base closures as the reason they met the goal). Other communities reported they could contrive a wide range of numbers for their community using the required measurement methodology.

- **limited relationship to program performance and to 'percent recycled'-type measures:** Our investigation of the AB939 measure found that the generation-based AB939 diversion rates showed little relationship to the programs in place, to program expenditures, or to the percent of recycled or diverted materials (calculated as a percent of disposed and diverted tons). This was true even when community estimates of commercial sector achievement were included. Basic calculations of "percent recycled" were much more closely related to programs in place, and to the performance of specific program elements in increasing recycling.

- **concern about future measurement:** Because the AB939 measure is disposal-based, we find a number of communities have ceased collecting data on recycling or program tonnage altogether because it is not required. This raises a serious concern, because it limits the ability to conduct program-related analyses or develop conclusions about high-performing programs. The lack of data also makes it more difficult to check progress of specific programs or sectors, evaluate their performance, assess cost-effectiveness, or benchmark to other communities in the future.

Certainly, the State has provided flexibility and leniency in allowing adjustments to base year data and other adjustments to address some of these issues. But the need for adjustments points out difficulties in developing good measurements of progress. Tracking of both disposal-based measures as well as programmatic and sector tonnages would provide the State the capability to support evaluation of program efforts on an on-going basis.

Impacts

The evolution of programs in California followed a fairly uniform path, moving from curbside recycling and PAYT to curbside green waste to business corrugated programs.[33] Some mandates were implemented, and communities achieved 25% "… without too much trouble."

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[32] These issues were presented in detail in Skumatz, Lisa A., Ph.D., 1999. "Achieving 50% in California: Analysis of Recycling, Diversion, and Cost-Effectiveness", prepared for California Chapters of SWANA, Skumatz Economic Research Associates, Inc. (SERA), Superior, CO.

[33] The AB939 program is one of the few state laws for which estimates of the costs to communities have been estimated. One report (Skumatz, Lisa A., 1999, "Achieving 50% Diversion in California…", prepared for California Chapters of SWANA, Skumatz Economic Research Associates, Superior, CO) estimated that, by 1998, communities had expended about $470-580 million on programs, and consumers had experienced about $260-460 million increase (or about a 15-25% premium) in trash bills due to the legislation, and to reach 50% would require an investment of about $700-875 million investment, and a $340-670 million (up to 35% premium) in trash bills.

However, after reaching 25%, communities found it harder to reach 50%, and at that point the focus turned to business audits and technical assistance programs and especially construction and demolition (C&D) debris programs. Local C&D recycling ordinances establish programs like required plans or rebate / deposit approaches (local because "locals" have control of permits). The next phase seems to include mandatory residential and commercial recycling ordinances to get the "unconverted" and food waste programs.[34] The three-bin "fantastic three" (single bins for each of greenwaste including food, trash, and recycling) and its variations are growing. Source reduction programs are a focus, but significant diversion is slow. They have proven to be "elusive to measure and difficult to implement." Targeting consumers and end-user businesses on disposable diapers, dual-sided copying, ceramic cups and similar programs were the initial phase, and more attention is now being paid upstream to reusable transport packaging to have a bigger impact.

Strengths / Weaknesses / Conclusions

The State's goal was not set based on a study, but was a goal set as a benchmark that would represent a move in the right direction.

One roundly-noted negative associated with California's program is the measurement method. The measurement method was called "soft" by one interviewee; an evaluation of the legislation[35] found no relationship between the reported landfill diversion results and the diversion by recycling and yard waste programs in place.[36] The result is that if there were two cities "side by side" with the same programs, one might be at 40% diversion and another at 65% because of "flukes" in the base year.[37]

- Problems with California's measurement approach include base year accounting for all landfilled tonnage against which future years would be measured and the influence of changes in economics,
- Problems with other measurement methods include accounting source reduction, addressing exports, and quantifying all materials handled through the private sector other than municipal programs.[38]

One interviewee noted that at least the diversion method, by comparing to a base year, could help address the problem of the "pie" getting bigger over time. Absolute decreases in landfilled tonnage may be the best approach, so that increasing diversion of a bigger generation level is not rewarded.

The conclusion from most all interviewees, however, is that performance standard monitoring is key to assuring progress. The interviewees also noted that if it weren't for those numbers and

[34] With residents' addictions to plastic bags causing some complications in these programs.
[35] Skumatz, Lisa A., Ph.D., 1999, "Achieving 50% in Diversion…", prepared for California Chapters of SWANA, Skumatz Economic Research Associates, Inc. (SERA), Superior, CO.
[36] Certainly, the relationship should not be exact, as the program diversion figures would not include commercial diversion or source reduction. However, one might hope that communities with aggressive and strong-performing programs covering 40-60% of their waste stream should have higher landfill diversion rates than those without, and this was not the case.
[37] A few counties have "lucked out", and for whatever reason, the 1990 base year was the zenith year for landfilling, making it easier for those communities to meet targets; other communities were not so lucky.
[38] One interesting comment was about a measurement method that was reportedly applied in San Francisco prior to AB939. To figure out how much recycling was happening in San Francisco, municipal staff talked with packers, brokers, big operators, and asked each of them about a key list of commodities and players, and interviewed all significant players to ask about tonnage out of San Francisco for both their own firm and each of their key competitors. The staff reportedly "discarded" the number for their own firms and kept the others!

performance standards (and the dollar penalties behind them), the cities might not have done anything.

Several interviewees noted that the California Integrated Waste Management Board could also be more effective and efficient vehicle in supporting local efforts. The Board's liaisons with local officials are civil service, and are often hired and transferred from within the system – including assigning ex-prison workers to be recycling experts, and the "… good ones seem to get transferred out".

The interviews pointed out an interesting problem in moving diversion forward even further – the difficulty of siting a compost site in the State of California. This would remove a critical barrier in increasing diversion, and has been found to be a problem in many communities across the State, and would improve soil health and resource conservation in the State.[39]

3.3 Iowa Status Quo

3.3.1 Overview

A variety of secondary sources were used to identify demographics, industry, and programs in the State of Iowa to provide comparisons and strategy options for Colorado.

Demographics

According to the US Census Bureau's 2006 American Community Survey there is estimated to be 2.94 million residents in the State. There are nearly 1.32 million housing units in the State and the median home value in Iowa hovers right around $82,500 dollars. The median family income is $55,735 and the per capita income is $23,115. In Iowa, 77% of the residents live in incorporated areas. The average town size is 2,400 residents and the median town size is 483. The largest city in the state is Des Moines, with 195,000 residents.

Economics

The 2002 U.S. Census Bureau's Economic Census provides insights into the employment in the state. The three largest sectors of employment by number of paid employees are:

Table 3.5: Major Iowa Industries

NAICS Description	Paid Employees
Manufacturing	222,968
Retail Trade	176,251
Health Care and Social Assistance	181,388

[39] And, according to at least one interviewee, should be more important than "sexy, high-capital cost conversion technologies".

Garbage

In 2007 Iowa generated 3.7 million tons of municipal solid waste (MSW), landfilled 2.2 million tons, recycled 1.2 million tons, composted 290,000 tons, and sent 33,000 tons of materials to Waste-to-Energy facilities (WTEs)[40]. The average diversion rate in Iowa in 2007 was 24.1%. This is lower than the nation wide average of 28.5%[41]. The per capita recycled tonnage in Iowa is 0.397 tons/person/year and the disposal rate is 0.740 tons/person/year. Table 3.6 displays these data.

Table 3.6: Iowa Waste Generation and Diversion

Material	Estimated Tonnage	Estimated Rate
Total Generation	3,700,000	100%
Landfilled	2,188,000	46%
Recycled	1,175,000	32%
Composted	290,000	8%
Waste to Energy	33,000	<1%
Total Diversion	1,981,000	40%

Iowa Material Recovery Facilities

Iowa has 13 different Materials Recovery Facilities (MRFs). Compared to the rest of the country, Iowa is just above the average of 11 MRFs per state[42], but on a per capita level Iowa has almost double the amount of MRFs per person as the rest of the country. Nationwide, there is a MRF for every 540,000 people, and in Iowa, there is a MRF for every 226,000 people. The locations of the Iowa MRFs are displayed below.

Table 3.7: MRFs in Iowa

Location	Number of MRFs
Carroll	1
Cedar Rapids	1
Clinton	1
Davenport	2
Des Moines	2
Fort Madison	1
Iowa City	1
Ottumwa	1
Sac City	1
Sheldon	1
Sioux City	1
Total	13

3.3.2 Literature Review

The State of Iowa reports progress in solid waste management on its State DNR website. A variety of these reports were reviewed as part of this analysis, and the information is reported in the following sections.

[40] *The State of Garbage in America,* Bio-Cycle. Volume 47, Number 4. April 2006

[41] *The State of Garbage in America,* Bio-Cycle. Volume 47, Number 4. April 2006

[42] Berenyi, Eileen Brettler. *Materials Recycling and Processing in the United States Yearbook and Directory, Fifth Edition*. 2007-2008. Westport, CT: Government Advisory Associates Inc. ©2007.

3.3.3 Report on Community Programs

Secondary reports and interviews with State authorities were used in assessing the status quo of community solid waste management in Iowa. The following paragraphs summarize the findings.

Garbage Collection:

Approximately 57% of communities in Iowa reported the use of some sort of Pay-As-You-Throw (PAYT) rate structure. The average rates charged to residents on a monthly basis for garbage collection services were reported as between $8-$15 per month; when recycling is optional, the cost are $5 to $8 extra per month. Mandatory garbage service was most frequently reported in urban areas, while other areas varied between mandatory and optional garbage service. The table below shows the types and frequency of different PAYT programs in Iowa communities.

Table 3.8: Iowa Waste Management Programs

Type of Collection	Estimated Percent of Communities
Multiple Private Haulers	65%
City Collects	25%
One hauler via Contract	10%
Pay-As-You-Throw	57%
Mandatory Garbage Service	25%

Recycling Collection and Availability

Over half of Iowa communities reported access to either curbside and/or drop off recycling programs. Approximately 64% of the population is serviced by curbside recycling programs. Iowans without access to curbside recycling service have access to roving drop off or drop off recycling programs. A little less than half of the recycling programs provided in Iowa are run by public entities. The majority of communities provide curbside recycling pickup on a weekly basis. Drop off and curbside recycling programs collected 12 different materials, on average. The most common materials to be approved for recycling at the curb or drop off sites are: newsprint, HDPE #2 plastic, tin cans, aluminum, and clear glass containers.

Yard-Waste Programs:

Only about 5% of communities in Iowa report the presence of curbside yard waste collection programs, and the state reports that a large majority have drop-off programs.

Other Programs

No information on additional programs was obtained.

Tip Fees

The average tip fee (per ton) was reported as approximately $33.25/ton.

3.3.4 Interviews with State Officials and Others

SERA staff conducted interviews with several state officials and stakeholders to identify key "drivers" that moved recycling forward in the Iowa, how key legislation worked, and the strengths and weaknesses of the situation and recycling / diversion in the State. Key factors leading to increased recycling in the State were reported to include:

- Legislation, including the planning requirements and the bottle bill,
- Funds to support program planning

Recycling Enablers and Elements of Relevant Legislation

The bottle bill was established in 1978, and it "created an ethic" for residents. Recycling (beyond that) was then dormant until work on the ground water protection act began, and it was noted that one element of protecting the water was to minimize what happens at the landfill. Thus, the groundwater protection law was put in place with sections that required 25% diversion by 1994 and 50% by 2000. It also enumerated a list of basic materials that should be recycled (paper, plastic, glass, aluminum, steel), and that cities, counties, and municipalities would be responsible to the State for reducing the waste going into the landfills. The legislation also required comprehensive plans to be completed and updated periodically (they are on the 4th round of revisions).

The legislation did not prescribe how jurisdictions should achieve that goal (nor did it provide strong funding to the communities). Some rural communities created drop-off recycling sites to comply, and other areas installed curbside programs. There was no penalty[43] for falling short of goal, and reporting authority for measurement of progress was established at the multi-jurisdictional "Planning Area" level.

The original legislation did not include a direct financial penalty of the sort introduced by California; instead another form of financial incentive is provided through the funding mechanism (see description below).

Within the last few months, this legislation was being studied for possible revision. The enablers associated with both the past and current legislative efforts included:[44]

- the legislature (which ultimately bowed out this time),
- county and city governments and associations,
- landfills, which carry considerable weight and responsibility in this system and represent a relatively strong lobbying voice[45], and potentially
- farm bureau[46] and similar voices.

[43] In the latest version of the legislation there is a penalty. In Iowa Code 2003: Section 455D.3 the penalty is described. There is a $0.50 per ton penalty paid by the planning area if it fails to meet the required diversion rate. The funds are deposited in a solid waste account and are used to fund alternatives to landfilling. The penalty continues until the planning area can document that it has achieved the required diversion level.
[44] It was suggested by one interviewee that environmental groups may not wield that much power in Iowa.
[45] Through a quasi-governmental "Rule 22" entity arrangement available to landfills, schools, and certain other entities.
[46] It was stated, for instance, that "the farm bureau will fight the bottle bill all day long…".

In addition, one interviewee suggested that the presence of paper mills and some other local markets – and state rail lines that allow easy shipping of materials to in- and out-of-state markets help recycling in the state.

Funding

Funding for programs and planning is provided by a landfill tip fee surcharge of $5 per ton, remitted to the state. A sliding scale is then introduced, with differing shares of funds retained by the jurisdiction depending on the level of diversion achieved by the planning area. The landfill surcharge is broken into four categories, depending on the performance of the Planning Area relative to the 25% and 50% goals, and the 36% average across the state that was achieved in 2000 (the year the 50% goal was originally supposed to be achieved). The Planning areas collect different surcharges based on their performance category (less than 25%, 25-36%, etc.) and remit some to state and retain some for their local program implementation efforts. The fees, generally a $3.25 - $4.75/ton surcharge, vary depending on the community's landfill diversion performance:

- If less than 25% diversion, collect $4.75/ton and remit $3.30/ton to state (retain $0.95 for implementation / planning and $0.50 for environmental protection);
- If 25-50% diversion, collect $3.65 / retain $1.45-1.55;
- If over 50% diversion, collect $3.25, retain $1.30.

This was the legislation's way around the "unfunded mandate" concern and helped the legislation pass – collecting fees and keeping some of the funds. All public and private landfills within the state are covered, and the fees are assessed on all waste disposed of within the state (including imported waste); however, exported waste, while tracked, is not charged extra tonnage fees. Some of the fees that go to the State are used to fund grants that may be awarded to communities for programs, equipment, and other assistance. These grants have been offered for many years, with communities all across the state benefiting. There have been some discussions about whether the jurisdictions that export should be eligible for the grant program, but to date, they have been eligible.

Measurement and Enforcement

Progress toward the goal is reflected using a landfill diversion metric, very similar to that established in California. Regular reporting by Planning Areas provides a mechanism for State review and enforcement. One element of enforcement includes a requirement that if the Planning Area did not reach the 25% or 50% goal, then every city in the planning area must implement a PAYT program; as a result, out of approximately 950 communities, about 650 or 700 have PAYT.[47] If a Planning area does not reach the 25% or 50% goal, they are also required to either send a letter to all households within the community, or take out a large ad in the local newspaper, explaining to residents that they did not reach the state-required goal.

Impacts

Most report that legislation was the biggest factor in moving recycling forward in the State of Iowa. It requires access to recycling for glass, paper, plastic and metals. In addition, the legislation helped lead to widespread adoption of PAYT.

[47] It was suggested that there is "… not great enforcement…" on the implementation of PAYT aspects of the legislation.

Strengths / Weaknesses / Conclusions

Recently the State of Iowa was in the process of revising the legislation, but this process was abandoned at a point short of an organized report. Although there was interest by the regulated communities to institute revisions, for some reason the revisions were not moved forward as a Department of Natural Resources (DNR) or legislature priority. The legislation is 20 years old, and some of the major issues with the existing legislation that were hoped to be modified are described below.

- Goals have passed and recycling progress in the state has plateaued, and changes were desired to help move recycling forward again;
- The landfill diversion-based measurement method has flaws, with particular problems associated with the 1988 base year. It is perceived that the measurement method works better in urban than rural areas.[48] New methodologies were being examined, including options that better rewarded activities associated with keeping hazardous materials out of the landfills and other / broader / related environmental improvements.[49]
- Revisions of the landfill tipping surcharge were sought, leaning toward a different generator fee structure (perhaps a percentage charged on all generators who throw trash away, collected through trash hauler bills), which was assumed to be a more stable revenue source.
- They were considering changing from the multi-jurisidictional "planning areas" to resource management commissions, taking on more than narrow recycling and solid waste issues. Instead of "… just planning for tons, they would be responsible for managing and reporting on an environmental management system (EMS)" and measure energy, waste, and similar items toward goals.

Interviewees also suggested the following as considerations and weaknesses:

- Some feel with no financial penalty and reporting requirements at the multi-jurisdictional Planning Area level, some communities are not making strong efforts to comply.
- Others suggested that some aspects of the current legislation may be difficult to enforce; for example, requiring PAYT of all communities would be easier to enforce than the requirement to implement it should the 25% or 50% goals not be reached.

Internal Flow Control: One element that makes Iowa unique is that they asserted within-state flow control – waste generated within the Planning Area must be disposed within that Planning Area – and this has been challenged in the Eighth District court and upheld (Iowa 455B.306(6E). Given federal interstate commerce clauses, the waste may, of course, go outside the State, and these exports are tracked for measurement and fee purposes. This intrastate waste transportation provision is believed to have maintained the viability of local landfills instead of material being lost to large neighboring competitors (which helped many stakeholders).

Subtitle D landfill requirements are just being implemented (later than some other states), and that is responsible for the closing or potential closing of probably 10 landfills in the State, leaving a few Planning Agencies without landfills. The legislation requires waste to be disposed of within the planning area and as a result, these agencies might be left with the only option as

[48] There are several reasons, some related to the base year issue. Many rural areas had no scales in 1988, so base years involved estimates. In addition, there have been changes in behaviors related to use of "burning and the back 40…" in rural areas, and the landfill diversion method would penalize improved behaviors for this type of waste management, for instance.

[49] The current method rewards diversion of inert foundry sand and doesn't reward diversion of low-weight hazardous materials.

export out of state or joining with another planning area. This is not the intended consequence – especially since some of the Planning Areas facing this issue were above 25% diversion, and if they joined neighbors they would fall below the 25% threshold. New legislation was passed to address this issue, allowing Planning Areas that close all the landfills and use a transfer station to manage the waste to a different Planning Area's facility; however, it must track the waste for fees and other purposes. About three Planning Areas have taken or are expected to take advantage of that option.

3.4 Oregon Status Quo

3.4 1 Overview

Data from a variety of secondary sources and the web were used to assess the status quo of solid waste management in Oregon, augmented by targeted interviews with State officials.

Demographics

According to the US Census Bureau's 2006 American Community Survey there is estimated to be 3.7 million residents in the state. There are nearly 1.59 million housing units in the state and the median home value in Oregon hovers right around $152,000 dollars. The median family income is $55,923 and the per capita income is $24,418. In Oregon, 68% of the residents live in incorporated areas. The average town size is 10,146 residents and the median town size is 1,650. The largest city in the State is Portland with 537,081 residents.

Economics

According to the 2002 U.S. Census Bureau's Economic Census the three largest sectors of employment in Oregon, by the number of paid employees are:

Table 3.9: Major Oregon Industries

NAICS Description	Paid Employees
Manufacturing	184,151
Retail Trade	183,706
Health Care and Social Assistance	165,787

Garbage

In 2006 Oregon generated 4.3 million tons of municipal solid waste (MSW), landfilled 2.2 million tons, recycled 1.6 million tons, composted 431,000 tons, and sent 155,000 tons of materials to Waste-to-Energy facilities (WTEs)[50]. The overall diversion rate in Oregon in 2006 was 46%. This is higher than the nation wide average of 28.5%[51]. The per capita recovered materials in Oregon averages 1,365 pounds/person/year and the disposal rate is 1,753 pounds/person/year. These data are displayed in Table 3.10.

[50] *The State of Garbage in America,* Bio-Cycle. Volume 47, Number 4. April 2006
[51] *The State of Garbage in America,* Bio-Cycle. Volume 47, Number 4. April 2006

Table 3.10: Oregon Waste Generation and Diversion

Material	Estimated Tonnage	Estimated Rate
Total Generation	4,325,000	100%
Landfilled	2,189,000	51%
Recycled	1,550,000	36%
Composted	431,000	10%
Waste to Energy	155,000	4%
Total Diversion	1,981,000	46%

Oregon Material Recovery Facilities

Oregon has 10 different Materials Recovery Facilities (MRFs). Compared to the rest of the country, Oregon is nearly on par with the average of 11 MRFs per state[52]. Nationwide, there is a MRF for every 540,000 people, and in Oregon, there is a MRF for every 370,000 people. Although Oregon has nearly the average number of MRFs located in the state as the rest of the country, the geographic distribution of the facilities is heavily skewed toward the Portland Metro area. The geographic concentration of the MRFs is a concern. An interviewee remarked that this concentration of MRFs creates a unique problem. Due to the ten MRFs being in such close proximity to each other, an environment of high competition has fostered price wars and caused a downgrading of material due to MRFs cutting costs. The locations of the Oregon MRFs are displayed below.

Table 3.11: MRFs in Oregon

Location	Number of MRFs
Canby	1
Clackamas	2
Hillsboro	1
Portland	5
Wilsonville	1
Total	10

3.4 2 Literature Review

During the completion of the literature review, the SERA researchers referred to the annual comprehensive study of materials recovery and waste generation rates by the ODEQ. Private and public recycling collection companies and collection service providers are required to complete a survey providing data on materials collected for recycling, composting, or energy recovery every year. The survey is quite detailed, and enables the ODEQ to track the rate of diversion and waste generation by specific materials for each community or "wasteshed." The full results of this survey can be seen at: http://www.deq.state.or.us/lq/pubs/docs/sw/2006MRWGRatesReport.pdf.

[52] Berenyi, Eileen Brettler. *Materials Recycling and Processing in the United States Yearbook and Directory, Fifth Edition*. 2007-2008. Westport, CT: Government Advisory Associates Inc. ©2007

3.4 3 Community Programs and Status Quo

SERA reviewed various databases from Oregon DEQ's website to gather more detailed information about solid waste collection, landfill rates, current availability of recycling programs, and the occurrence of other diversion activities in the state.

Interviewees

SERA staff conducted interviews with multiple state officials regarding community programs; however, most of the information in this section derives from a review of the data on ODEQ's web site and reports, mentioned earlier.

Garbage Collection

Nearly all communities in Oregon reported using a volume based Pay-As-You-Throw (user fees, variable rate) structure, based on three levels of service. The average rates charged to residents on a monthly basis for garbage collection services was reported as $10-21 for a 30 gallon can. $13-30 for a 60 gallon can, and $13-35 for a 90 gallon can. Mandatory garbage service was reported as being rare.

Table 3.12: Oregon Garbage Collection

Type of Collection	Percent of Communities
Multiple Private Haulers	65%
City Collects	25%
One hauler via Contract	10%
Pay-As-You-Throw	100%
Mandatory Garbage Service	25%

Recycling Collection and Availability

The majority of Oregon communities have access to either curbside or drop off recycling programs. Approximately 95% of communities interviewed reported curbside recycling programs as being provided, 64% reported that participation in curbside recycling was required, and 79% reported having access to drop off centers. The majority of respondents also reported that curbside recycling pickup occurred on a weekly basis. Communities, on average, had 10 different types of materials approved for recycling. The most common materials to be approved for recycling at the curb or drop off sites are: aluminum cans, tin, newspaper, oil, and corrugated cardboard.

Yard-Waste Programs

Almost all of the communities interviewed reported the presence of curbside yard waste collection programs, with pickup occurring biweekly most frequently. Note that the State also has combined yardwaste and food recovery composting at two privately owned and operated facilities in the State.

Other Programs

Oregon has had source reduction "on the brain" for many years. They have studied options, including which programs are strong, options for measurement, and other issues related to source reduction options. Progress has been made in three key areas.

- First, a legislated minimum recycled content standard is in place for newspaper, phone directories, rigid plastic containers, and glass sold in the state.
- Second, Oregon has mandated specific diversion goals for various categories of urban and rural areas in the state. A community may implement a waste prevention, reuse, or backyard composting program to receive a 2% credit to use towards reaching their diversion goal.
- Third, the state has undertaken cutting-edge work conducting studies of transport packaging to try to identify the lifecycle costs, and upstream / downstream effects of different methods of sending packages. These studies have helped guide programs at the business level.[53] These studies, to date, have identified interesting (and somewhat non-traditional) findings, including results that shipping via plastic bag has preferable environmental effects to shipping by cardboard box.[54]

Oregon also has a number of bans on material disposal in local landfills including: automobiles, appliances, oil, un-shredded tires, batteries, and hazardous waste from regulated generators.

In addition to implementing source reduction programs at the point of production and residential disposal levels, Oregon also aggressively regulates waste in the commercial sector. Commercial entities in Oregon's Portland Metro areas (four populous counties around Portland) have commercial PAYT – with rates varying by size of container and frequency, ***with recycling costs embedded in the trash fees***. Compliance with the aforementioned requirements is ensured by audits.

Tip Fee

The average tip fee ranges from about $0-$65 per ton, with the average reported as approximately $35/ton.

3.4.4 Interviews with State Officials and Others

Interviews were conducted with multiple state officials and experts knowledgeable in Oregon's programs and context. The results are summarized below.

Recycling Enablers and Elements of Relevant Legislation

The State of Oregon's path to recycling was a little different than that of other states. State officials note that the motivator for recycling in Oregon was not landfill conservation, but resource conservation, and that it still remains a more important motivator than the landfill side of the equation. It was important to residents and state officials from early on, partly spurred by

[53] Note that Oregon, along with other states, has a significant number of catalogue stores like Norm Thompson, etc., making this a relevant issue for the State. David Allaway of Oregon's DEQ is a recognized expert nationally on this topic.
[54] Some of these results, and the programs' focus, can be found on ODEQ's website.

this green ethic coming from both public demand and program delivery sides. Upstream impacts have been considered in Oregon including greenhouse gasses, and the focus is not predominantly on landfill impacts. This ethic was also made relevant because of the important presence of paper mills in the state. Over the years, these paper mills have invested heavily in de-inking capacity to allow use of recycled content input.

The port provides another strong enabler for recycling in the state. Easy access to foreign markets – allowing the flexibility of recyclers options to local markets should they ever become weak – helps improve the economics and stability of recycling in the State. State officials report that even at the trough of recycling markets, prices for paper in Oregon never went negative, as they did in some areas of the nation. Given the self-interest of Oregon paper mills in maintaining a supply of materials in the long term, avoiding a negative price was prudent. The State notes that the minimum content statutes adopted in California have helped fuel demand for the State's recycled content product considerably.

Subtitle D has not been a major driver in this state. The state has numerous large landfills (some used for out of state waste, including Seattle's) and there have been no shortages.

The state adopted the Opportunity to Recycle legislation in 1983 which has subsequently been updated in 1991 and most recently in 2005. This legislation has several key elements.

- It establishes recycling goals – but goals with a difference. Higher goals are established for urban communities than for more distant, difficult, rural communities and counties.
- Communities with more than 4,000 population are required to provide recycling, including a minimum set of materials.
- It developed a list of best practices (see shaded table below), and requires small communities to adopt at least 3 of them or develop an alternative method of achieving the recovery rates set forth by the Act; and larger communities must adopt at least 5 of them or develop an alternative method of achieving the recovery rates set forth by the Act.

The State also requires that rates for residential trash service must vary with the "amount of service provided". Some haulers elect to use rate differentials that vary based on volume; most gauge their rate differentials to ratios of the weight in different can sizes.

Oregon's Opportunity to Recycle Act Recycling Elements – for communities with populations of 4,000 or more	
• Residential curbside including: regular collection, a container, and recycling of a specified set of 4 key materials (or greater); • Expanded education and promotion of recycling of designated frequency that notifies residents of the opportunity to recycle and encourages source separation of recyclables; • Collection of at least 4 recyclable materials from multifamily complexes; • A system of yard waste collection depots open at least once a week;	• Regular on-site collection of source separated principle recyclable materials from commercial generators with 10 or more employees or occupying 1,000 square feet or more in a single location; • Expanded depots for recycling including at least principal materials with regular, convenient hours including weekend days. • Monthly or more frequent on-route collection of yard waste from residences for composting or marketing; • PAYT residential collection rates that have lower rates for small containers, smallest container no larger than 21 gallons, rates that vary with pounds of waste disposed in the containers.

The Opportunity to Recycle Act led to adoption of curbside programs; however, the State notes it was slow to figure out the best curbside programs. They started with many separations to preserve clean materials; after moving to dual stream when it had become standard in many

other states, the State has now adopted widespread single stream[55] – except glass which is almost universally collected on the side in Oregon (inserts or drop-sites). The rationale behind this was to preserve cleaner materials for (local) paper mills, and reduce wear on the machinery.

State officials and others familiar with Oregon's system note the positive impact of the bottle bill on recycling in the state. They note that the bottle bill leads to 80% recovery of cans in the State, compared to 28% in non-bottle bill states (and 70-80% vs. 30-35% for bottles).

Funding

Each city or county is responsible for establishing programs; the funding is largely derived from the franchise fees on hauling. The recycling requirements are perceived to provide a business opportunity for the haulers, providing more revenue (and the cities then receive a franchise fee on these revenues). This arrangement was developed to help get the legislation approved.[56] Generators, thus, pay the fees for the programs.

Measurement

The State of Oregon's Department of Environmental Quality (DEQ) calculates a statewide "Annual Recovery Rate" each year. The DEQ's process is a unique approach, quite elaborate, and much more extensive than necessary for a single jurisdiction.

Oregon has probably the most comprehensive measurement system of any state.[57] The DEQ has been calculating the State's Annual Recovery Rate since the early 1990's, and now uses a sophisticated software program to run the calculations. The data are based on mandatory reports submitted by haulers, some large generators, and recyclers (scrap metal dealers are exempted). The reports include how much was recycled and to whom it was sold. DEQ tracks the materials to their endpoints, and then balances what is bought and sold. This is a very labor-intensive effort and requires substantial legwork by the DEQ staff. The resulting information is reported back to each "wasteshed" (counties or other jurisdictional entities) in the state. The analyses allow the state to make sure it is not double counting, AND allows it to track commercial and other diversion. One other important advantage is that, if there is a change in diversion rate, the State can understand where the change comes from (higher generation, less residential or commercial recycling, less composting, etc.) – an advantage that is not experienced by states that use landfill diversion metrics.

There used to be penalties for not meeting goals, constructed as having to implement more programs if the goal wasn't reached. However, by 2001, it became clear that the state would not reach goals, and new goals were established by the Waste Policy Leadership Group

[55] State officials suggest that the State's MRFs, with their paper focus, operate differently than in other places. They pick off the materials and leave the paper as the last product. They pick off garbage, plastic, metal, aluminum, and cardboard off the line, and then the leftovers go out as newsprint. This avoids handling 60% of the material; however, if it is not picked off, it goes out as newsprint. Some studies have indicated that perhaps 20% of the plastic bottles are coming out in newsprint bales (they flatten and are hard to detect). With too many MRFs in the Portland area, prices are being cut and they are not doing extra sorting, so the quality of the newsprint to mills is deteriorated.

[56] The local governments cannot franchise the profitable / marketable recyclables – products that have fair market value ("does not apply to source separated materials purchased or exchanged for fair market value"). This has not yet been tested.

[57] One full time staff and some part time staff are involved in this work – checking and rechecking flows. The investment in a dedicated piece of software was perhaps $400K. The process was based on the detailed measurement that Washington State *used* to do.

(WPLG).[58] At that time, the new goals were adopted, there was a tradeoff to be negotiated between low goals / strong enforcement, or aggressive / stretch goals that people measure and try to meet, with care about implementation of high quality programs, but with less formal enforcement. The latter option was selected. It seems that pride for the Oregon communities – with a bit of competition thrown in – has led to strong programs in the state.

Impacts

The bottle bill, the legislation, the local markets, and the resource conservation ethic have cooperated to provide very strong performance for recycling in the state of Oregon. Households and businesses are provide with convenient access (the name of the law), as well as incentives to divert materials. There is strong coverage of programs, and high diversion. Attention to factors beyond landfill diversion has led to a very strong understanding of what is happening in recycling.

Strengths / Weaknesses / Conclusions

Strengths were noted as:

- Bottle bill
- Measurement that helps identify what is happening in the state.
- Legislation requiring strong access to programs
- Evolved curbside programs that balance convenience and cost with high quality materials
- Local markets for key materials
- Access to ports / markets
- Consumer awareness / interest
- Funding sources (sustainable)
- Goals that reflect the differing recycling potential in different parts of the state – not "one size fits all".

One weaknesses of this system might be the high cost of measurement.

3.5 Colorado Status Quo

3.5.1 Introduction - State of Colorado Status Quo

In order for Colorado to travel on a roadmap to higher statewide diversion, it is important to first understand the *status quo* in the State. The SERA team completed a comprehensive review of solid waste collection and diversion in the State to pin-point where Colorado currently stands in terms of waste diversion and reduction. The research undertaken included literature reviews of published materials, a web review, and in-depth interviews of a random statistical sample of 13% of the communities in the State. Additional interviews were completed with the three largest cities in Colorado, a number of landfills and several non-profits serving the recycling needs of rural, mountain, and plains communities. Combined, these interviews covered nearly 40% of the State population.

[58] See report, Skumatz, "Oregon Diversion Goals for the WPLG", prepared by Skumatz Economic Research Associates, Superior, CO.

3.5.2 Overview

Demographics

According to the US Census Bureau's 2006 American Community Survey there is estimated to be 4.75 million residents in the state. There are nearly 2.1 million housing units in the state and the median home value in Colorado hovers right around $232,000 dollars. The median family income is $64,614 and the per capita income is $27,750. In Colorado, 73% of the residents live in incorporated areas. The average town size is 12,873 residents and the median town size is 1,166. The largest city in the State is Denver with 567,000 residents.

Economics

The 2002 U.S. Census Bureau's Economic Census provides insights into employment in the State. The three largest sectors of employment by number of paid employees are:

Table 3.13: Major Colorado Industries

NAICS Description	Paid Employees
Administrative & Support & Waste Management & Remediation Services	258,614
Retail Trade	247,264
Accommodation & Food Services	206,597

Some of the other high employment sectors in the State include the Health Care and Social Assistance and the Construction sectors. The sector reporting the highest receipts, sales or shipments was the Wholesale Trade sector.

Garbage

In 2006 Colorado generated 7.9 million tons of municipal solid waste (MSW), landfilled 6.9 million tons, recycled 823,000 tons, composted 172,000 tons, and sent 3,000 tons of materials to Waste-to-Energy facilities (WTEs)[59]. The overall diversion rate in Colorado in 2006 was 12.5%. This is much lower than the nation-wide average of 28.5%[60]. The per capita recycling tonnage in Colorado is calculated as 0.179 tons/person/year and the disposal rate is calculated as 1.723 tons/person/year. Table 3.14 displays these data.

Table 3.14: Colorado Waste Generation and Diversion

Material	Estimated Tonnage	Estimated Rate
Total Generation	7,930,000	100%
Landfilled	6,932,000	87.5%
Recycled	823,000	10.4%
Composted	172,000	2%
Waste to Energy	3,000	<1%
Total Diversion	995,000	12.5%

[59] *The State of Garbage in America,* Bio-Cycle. Volume 47, Number 4. April 2006
[60] *The State of Garbage in America,* Bio-Cycle. Volume 47, Number 4. April 2006

Colorado Material Recovery Facilities

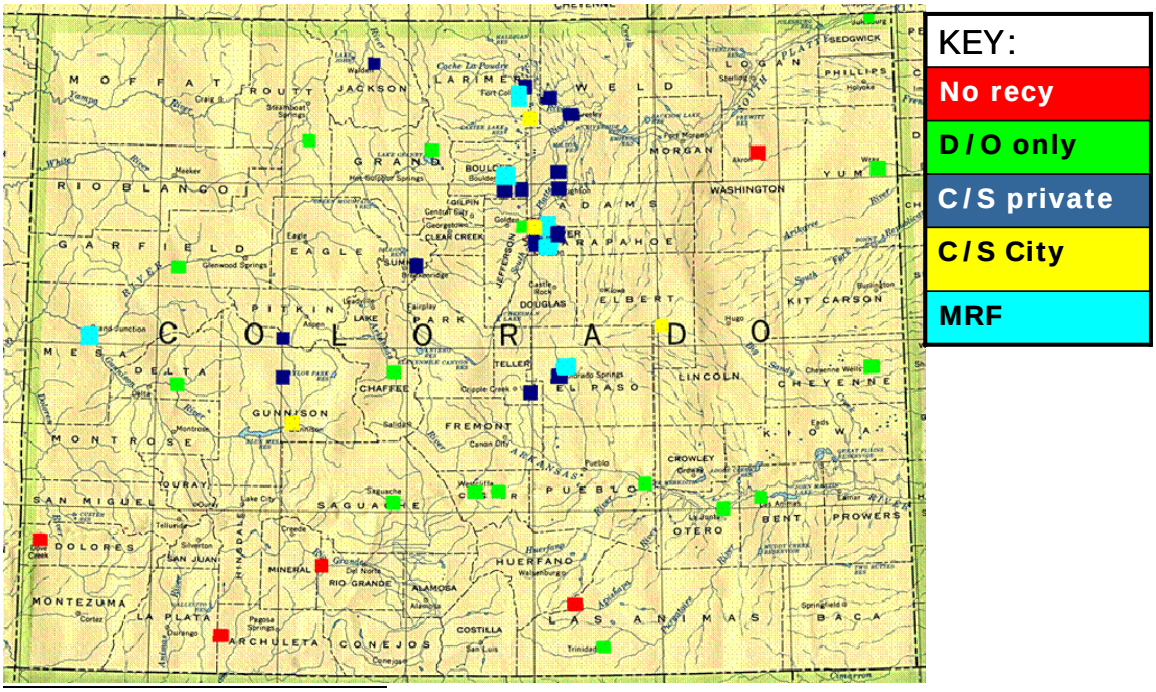
Colorado has seven different full scale Materials Recovery Facilities (MRFs)[61]. Compared to the rest of the country, Colorado has slightly fewer than the average of 11 MRFs per state[62]. There are 21 states with fewer MRFs than Colorado, and 26 with more[63]. Nationwide, there is a MRF for every 540,000 people and in Colorado there is a MRF for every 671,000. Although Colorado has nearly the average number of MRFs located in the State as the rest of the country, the geographic distribution of the facilities is heavily skewed toward the Front Range. More than half the MRFs (5 out of 7) are located in the Front Range and are within 70 miles of each other. Only one facility, the Grand Junction MRF, is located on the western slope. The locations of the Colorado MRFs are displayed below.

Table 3.15: MRFs in Colorado

Location	Number of MRFs
Denver	3
Boulder	1
Fort Collins	1
Colorado Springs	1
Grand Junction	1
Total	7

A map of the location of Colorado's facilities and program predominance follows.

Figure 3.1 Colorado Distribution of MRFs and Programs



[61] A few small scale MRFs, capable of baling and some amount of sorting have also been identified in Colorado including one in Pitkin County and one in Mesa County.

[62] Berenyi, Eileen Brettler. *Materials Recycling and Processing in the United States Yearbook and Directory, Fifth Edition*. 2007-2008. Westport, CT: Government Advisory Associates Inc. ©2007

[63] Berenyi, Eileen Brettler. *Materials Recycling and Processing in the United States Yearbook and Directory, Fifth Edition*. 2007-2008. Westport, CT: Government Advisory Associates Inc. ©2007

Note that the MRFs and curbside programs are centered around the Front Range (also the population centers, and that there are concentric rings of increasingly less access to recycling as you move out from those hubs.

3.5.3 Literature Review

During the completion of the literature review, the SERA researchers referred to a comprehensive study by the Colorado Municipal League and Colorado Curbside.Com. The survey was undertaken in the fall and summer of 2006 and 80% of the 271 communities in the state responded. The survey, although not overly detailed, was designed to collect threshold data from all of the communities in the State. Below is a listing of the highlights of the survey.

The highlights of the survey include:

- 17.3% of the communities reported trash service is provided by the municipality. This covers 31.9% of the State's population.
- The most common collection program type is multiple private haulers contracting directly with residents (48.4%).
- Slightly over 10% of communities reported having curbside recycling collection by the city or through a city contract with a hauler.
- 2% have recycling service through private contracts under a mandate to *provide*.
- 2% have recycling service through private contracts under a mandate to *offer*.
- One-fifth report recycling is a private agreement between consumer and hauler.
- 27% report having no curbside recycling programs but that drop-off is available.
- Almost 40% could not verify any recycling options available.

3.5.4 Community Interviews

To gather more detailed information about solid waste collection, landfill rates, current availability of recycling programs, and the occurrence of other diversion activities in the State, the SERA researchers selected a stratified random sample of 50 communities in the State and completed interviews with 80% of the sample. The surveys covered over 13% of the communities in the State in 32 unique counties and nearly 40% of the population. Interviews were completed for Denver, Colorado Springs, and Aurora, the three largest municipalities in the State. The research consisted of phone interviews coupled with the review of municipal websites where available. The incompletes consisted of towns where no contacts could be found (i.e. Cokedale, Population 139) or towns where contacts were uncovered but could not be reached to complete the survey.

Interviewees

The majority of the towns contacted did not have a position dedicated to recycling, solid waste, diversion, sustainability or a related position, so the interview was often conducted with the Town Clerk. In addition, a number of town managers were interviewed and in one case where the town had a population of less than 100, the only contact that could be made was the church pastor who was coincidentally in charge of any recycling efforts in the town. The largest city was Denver with a population of 567,000 and the smallest was Marble with a population of 98. The

average size was 47,000 and the median was just under 2,000. Only 28% of the communities interviewed had populations greater than 10,000 residents while 33% had populations under 1,000.

Garbage Collection

The average rate charged to residents on a monthly basis for garbage collection services was computed to be about $16.25. The maximum rate recorded was $30.00 a month and the minimum was $9.50. Only 15% of the communities reported using a Pay-As-You-Throw (user fees, variable rate) structure. The most common structure for garbage collection was reported as multiple private haulers in competition, followed by communities where collection is done by city crews. The least common system was one hauler via contract. One quarter of the interviewees reported that they have mandatory garbage collection for all city residents.

Table 3.16: Colorado Garbage Collection

Type of Collection	Estimated Percent of Communities
Multiple Private Haulers	65%
City Collects	25%
One hauler via Contract	10%
Pay-As-You-Throw	15%
Mandatory Garbage Service	25%

Recycling Collection and Availability

Almost 40% of Colorado municipalities could not verify any recycling options available; however, note that this represents about 10% of the population. More than a quarter (27%) report they have no curbside program, but that drop-off is available. About half stated that they have curbside collection available to residents, but that it is not necessarily used (especially because it often is an "adder" to the bill). The other half of communities does not have curbside available. About 3% were 'not sure'; they reported that they thought that collection was available but it could not be confirmed. Only one interviewee, Denver, reported that they used single stream collection for recyclables.[64]

The majority of communities, 72%, reported that they had drop-off available for recyclables. The type of drop-off recycling program differed greatly by community. Some communities, such as Fort Collins, have a full service, paved drop-off area run by the city with large multiple bins, collecting a wide variety of recyclable materials. Other communities reported that there are only drop-off areas at private businesses such as King Soopers or the local Video Store that collect a limited number of recyclable items. Still others reported that drop-offs were available at the church or elementary schools. Another 28% reported that there was no drop-off available. In a number of communities, the drop-offs were operated by a non-profit organization.

[64] Some Colorado communities in the state that were not interviewed have single stream. For example, Boulder has run two pilot tests of single stream and is implementing a system providing residential curbside single stream recycling fortnightly, and curbside yard waste collection on the alternate weeks. This program is expected to be implemented in summer 2008. Lafayette, which recently implemented PAYT, also implemented a single stream recycling program.

Case Studies in Colorado		
Colorado Springs, CO, Population 400,000 For Colorado Springs two members of the city staff were interviewed (both public works and code enforcement) and neither was able to confirm that residential curbside recycling service was available for residents. Instead, a private hauler was contacted and interviewed to ascertain the recycling opportunities available. The hauler reported that they served the majority of the city residents and recycling costs are embedded in their garbage rates. However, even with "free" recycling not all of the customers were participating. The hauler reported that slightly over half of their customers use the recycling bins and that some of the other haulers in town did not offer recycling or offered it for an additional fee. The city has no public drop-offs and the only drop-offs available are owned and operated by private entities. Barriers to recycling were reported by the hauler as a lack of political will power, education programs, and resistance to change from older residents.	*Non-Profit Recycling Co-op - Upper Arkansas Area Consortium of Governments (UAACOG)* UAACOG runs the Upper Arkansas Recycling program and provides recycling drop-off areas for four counties (Chaffee, Custer, Fremont and Pueblo) in the central and southern Colorado mountains. Any municipality or county in the area can become a member. Members must pay a fee, currently .96/cents per capita/year and the UAR will provide for the collection of drop- off recyclables. UAR began operations in 1998 and in addition to drop-offs, provides special recycling collection events for such items as e-waste. In 2006 UAR collected 856.26 tons of recycled materials. The largest single barrier facing UAR is the lack of recycling processing facilities in the area. All collected materials must be shipped to the Front Range for processing and with the ever increasing costs of transportation this is a constant barrier to increased diversion. According to Beth Lenz of UAR, the "most significant way the state could help us is to provide grant money for capital equipment". If the UAR had a baler it could greatly decrease shipping costs.	*Non-Profit Recycling Co-Op - South Eastern and Eastern Counties Recycling (SEEC)* Like UAR, the SEEC is a co-op of rural counties in Colorado. SEEC covers 13 different counties in the southeast and southern plains ranging from Las Animas to Lincoln county, a very wide geographic range. If a county becomes a member it covers the un-incorporated portions and the municipal members cover the incorporated areas. Similarly to UAR, member counties or municipalities pay a per capita annual fee and for that fee SEEC provides drop-off bins and collection of the bins. Reva Phillips of SEEC reported that one of the largest barriers to successful recycling is the large geographic area they are serving and the transportation costs associated with the service. For SEEC, funding for drop off equipment and education materials would help to increase diversion.

Only about 5% of the communities surveyed reported that they had recycling collection provided by city staff. More commonly, communities reported that the recycling services were available to residents through private haulers. Although recycling service is available to residents, it does not always mean that they are all contracting for the service (see shaded summaries in text box).

Three different non-profit recyclers operating in nearly 20 counties in Colorado were contacted for this project. The three groups were the Upper Arkansas Recycling Program, Yampa Valley Recycles, and South Eastern and Eastern County recycling (see shaded text box above). These non-profits provide a successful model for recycling in rural and geographically isolated areas. The Town Clerk for the town of Yampa in Routt County, reports that "without them (Yampa Valley Recycles) it would be impossible, we would have no recycling programs and residents would have to drive 32 miles to get to the nearest drop-off area."

Yard-Waste Programs

Only one of the communities interviewed reported the presence of curbside yard waste collection and none of the communities reported the availability of food waste collection and composting. Slightly over a third of the communities reported the presence of a drop-off area for yard waste materials such as brush, leaves, limbs or Christmas trees. However, importantly, the presence of a drop-off area or program did not mean that the materials were being composted.

Some of the communities who reported the presence of a drop-off area said that the collected materials were not brought to a compost yard but instead landfilled or burned. Additionally, a number of the more rural communities discussed the availability of burn piles or burn permits for residents to dispose of brush and yard waste. The Town Clerk from Aguilar (population 600) reported that there was no need for brush collection because there were "plenty of canyons and ranch areas" for people to dump their yard waste materials.

Other Programs

The majority of communities, 73% reported that there were bans on material disposal in their community. Many reported that they were 'not sure' what materials were banned and that the haulers must be contacted. The most commonly banned items were batteries, tires, oil and paint. The remaining 27% of communities reported that there either were no bans or no bans that they were aware of. None of the communities reported any significant construction and demolition programs or mandatory commercial recycling[65]. One tenth of the communities reported the presence of some sort of source reduction initiative and 8% reported a program targeting the commercial sector.

Tip Fees

In the majority of interviews, the interviewee was unable to report the tip fee at the local landfill. However, all of the interviewees were able to report what landfill the residents used. Follow-up calls were placed to all the relevant landfills and the tip fee for MSW was recorded. The average tip fee, per ton was reported as $28.60 with a maximum of $65.00 and a minimum of $0.00[66]. The average price per cubic yard was $7.60 with a maximum of $14.00 and a minimum of $0.00. It was interesting to note that one landfill in the south central mountains does not have electricity and the baling of recyclable materials was completed with the assistance of a gas powered truck engine.

False Starts

A small portion of the interviewees, 8%, reported that they used to have drop off areas but were forced to discontinue the program. The programs were not dropped due to lack of materials or interest but instead because they were either too messy or the contamination level was too high. The programs that were dropped were unmanned areas and the communities found that residents were either not properly educated or were not concerned with keeping materials separated, or that the drop-offs were receiving too much material between pick-ups leading to overflow. With the increased availability of single stream MRFs in the State (currently one in Denver and soon to be one in Boulder) the contamination barrier could possibly be overcome. In terms of the mess, one possible solution was reported by the Town Manager of Bayfield in La Plata County:

- *We used to have a drop-off area but the contamination was too high and it was very messy. We are now looking at a new site that would only be open on Saturday and*

[65] The city of Aspen has mandatory commercial recycling (embedded recycling fees in the commercial PAYT trash rates) and Boulder is planning a mandatory C&D recycling ordinance in 2008 but neither was in the random sample of interviewees.
[66] Otero County landfill is free to all county residents

Sunday. By having it open only two days a week we can have the site manned and reduce the mess and contamination.

3.5.5 What the Communities Want

The final question in the interview process was an open ended one asking the interviewee to report what assistance from the State they would find helpful. The most common response was funding for recycling programs, most often drop-off areas. Almost 50% of the respondents reported that funding would be helpful to them. The interviewees reported they would also like funding to buy equipment such as balers or to support the non-profit co-ops that operate their drop-off programs.

The second most popular form of assistance would be help in education programs. A third of the communities reported that they would like assistance from the State in educating their residents about recycling. Over one-fifth of the respondents reported that they would like to see state-wide legislation related to recycling mandates passed. A key caveat to this request is that the mandates be funded.

Table 3.17: What Municipalities Want

Assistance[67]	Percent Reporting
Funding	48%
Education	33%
Legislation	24%

3.5.6 Interviews with State Officials and Others

Elements and Enablers of the Legislation

Until recently, when SB182 and HB1288 were passed, there was very little solid waste-related legislation in the State of Colorado. SB182 moved responsibility for administration of a portion of the funds from the Waste Tire Fund from the Colorado Commission on Higher Education to the Colorado DPHE. HB1288 increased the surcharge on volumes of waste disposed at landfills by $0.10 per cubic yard disposed, and added $0.50 per tire disposed to the waste tire disposal fee. The Pollution Prevention Advisory Board Assistance Committee (PPABAC) was established to provide advice and assistance to the branch on the expansion of and availability for grants and rebates as a result of HB1288 and SB182. This grant program is designed to help address Colorado's lagging recycling infrastructure and programs.

Detailed interviews were conducted with persons involved in helping get legislation passed in Colorado – both broad legislation, as well as the specific HB1288 legislation – because the process and allies may prove a useful lesson for upcoming legislative initiatives.

- Incubation: The interviewees noted the importance of slow coalition building over a long period. As a starting point, the Colorado Association for Recycling (CAFR) has been a strong incubator of program ideas. CAFR's policy committee became more effective after

[67] Responses were lumped into broad categories by the SERA team. Actual responses included such statements as:

- Education is the key. I would like to see education in elementary schools so kids can make their parents recycle, would also like to see more mandatory recycling
- Changes in regulations to allow greater authority over haulers by the town and also grants for infrastructure like drop-offs

employing the services of a lobbyist, and building broad support from membership over time through CAFR summit forums. Extensive efforts by the CAFR executive director to collaborate with environmental groups like the Colorado Conservation Voters helped provide coalitions in lobbying.

- Coalitions and introduction "across the aisle": Legislation stands a better chance of passing if it can be carried by a moderate Republican, and other critical efforts include working with the State Health Department, because they will ultimately be conducting much of the work, and linking with other associations (the environmental community, perhaps Colorado Recycling Association, Colorado Beverage Association, and others). Several interviewees from other states indicated that, to be successful, the environmentalists must be supportive, as well as either the "state level league of cities or the league of counties" – whichever entity (city or county) was selected as the responsible entity – should be supportive or at least neutral. Working with these professional associations can bring expertise, credibility, and heft behind the potential legislation. In addition, the lobbyists associated with the largest haulers must be neutral or not opposed to the legislation, and would ideally be brought into the negotiations for the process to be successful.[68] Note also that if the bill has fiscal impacts, then the bill may be "double- or triple- assigned" to committees (adding Finance or Appropriations), which makes the process more complicated.
- Impacts and Talking Points: Supporting the legislation requires talking in the halls starting in January / February, but is most important in February through April, and each person must have and stick to key talking points that make the salient points. The supporters must have people standing by to provide well-researched expert testimony for committees, and the strongest testimony is that provided by local business representatives. Testimony that addresses data-driven estimates of jobs, environment, and other impacts are "heard" by legislators. The strongest testimony is well-prepared, written, and brief. Letters signed by mayors or city representatives on letterhead can be submitted as testimony and read into the record. Finally, phone trees are useful in getting calls made to local representatives (2-3 sentences about your interest, in favor, why it matters, and phone number) – with special focus on members of the committee(s) hearing the bill of interest. These calls may be needed for the committee – most likely the Local Government Affairs Committee, and the Health and Human Services Committee, and their leadership and members should be targets of calls to help improve chances for successful passage.

Funding

The funding derives from a landfill and tire surcharge (as described above).

Measurement

While measurement toward a goal is not relevant, the granting agency at the State level is instituting an attempt to measure the impacts of the grants.

Impacts

Not yet relevant.

[68] This was critical to passage of the Opportunity to Recycle Act in Oregon. One interviewee suggested that the haulers were interested in approval for a landfill; the state and environmentalists were interested in the legislation. The Act was passed with the reality of politics.

Strengths / Weaknesses / Conclusions

This legislation in place is a good start, but lacks some key elements in place in other states to give recycling and diversion a stronger and more consistent footing in the state.

3.6 Container Legislation

All of the states that were interviewed (other than Colorado) had container deposit legislation / bottle bills. Some felt this was a very important part of diversion; others did not stress it. However, the legislation is almost always controversial. We provide a summary of advantages and disadvantages of bottle bills below, without a recommendation.

Table 3.18. Strengths and Weaknesses of Bottle Bills

Strengths of Bottle Bill	Weaknesses of Bottle Bill
• Stronger recovery of containers than curbside programs only • Creates jobs in recycling • Keeps materials separate / cleaner • Reduces litter; may help recovery of single serve containers • Incentives for reducing waste • Reduces trash hauling • Retail is convenient site • Escheat can fund programs	• Parallel recycling program • Decreases product demand / discriminatory • Disincentives for recycling – increasing cost per ton • 95% of stream is non-containers; system for small segment of materials • Divert funds from recycling • May be large bureaucracy, depending on administrative model used • Not as convenient as curbside recycling • Escheat can be a political football

3.7 Elements of Legislation in Selected Additional Areas

Because no legislation is perfect, and every state is unique, we also searched out key elements from other states and their programs and legislation that might be useful to the Colorado case. The leading options are summarized below.

3.7.1 Wyoming – Planning Requirements in the Region

The State of Wyoming recently instituted planning requirements, with the responsible party named as the landfills. The plans must include several elements, including analyses of existing conditions, alternatives, services, facility needs, costs and funding options for a 20 year planning horizon, and the legislation calls for updates every 5 years. The funds for the Plans were raised from the general fund as part of the legislation.[69] Landfills conducting plans can obtain grants to pay for a portion of the plans; however, the costs of the plans are reimbursed on a sliding scale that provides an incentive for regional planning. If a landfill goes on its own, it can recover 50% of the cost of the plan; if two landfills plan jointly the reimbursement increases to 70% and if three or more plan jointly the plan can be reimbursed at the 90% level.[70]

[69] Wyoming has mineral rights and other funding sources. However, more landfills than expected came to the plate, and the DEQ's budget request is only sufficient to support about half of the plans. DEQ will likely be re-approaching the legislature.
[70] In one case (Casper area), a group of 12 landfills put together a joint plan.

3.7.2 Washington – Creative Funding Options, Grants, and Market Development Issues

Washington runs a State Coordinated Prevention Grant Program, and the funding source is likely one of the least objectionable we have found to date – a tax on the first in-state owner of toxic materials.

In Washington's last two year grant cycle, 2004 to 2005, the state provided over $24M in funding for solid waste and hazardous waste projects. Nearly 40% of the grant money was spent on programs to enhance waste reduction and recycling. To develop funding for the programs, the state uses an innovative tax on hazardous substances. To generate this funding, the state passed the Model Toxics Control Act (RCW 70.105D.070) which established a tax on the first in-state possession of certain hazardous materials. In addition, the state charges a hazardous waste generation fee of $35.00 per year to in–state generators of hazardous waste materials. The first goal of the grant money is to support the clean-up of hazardous waste site, but in 2004-2005 nearly $10M of the money generated by the fund was spent on waste reduction and recycling, with serious and measurable results.

The money is allocated by the Department of Ecology on a county-to-county basis with a base rate for each county plus a per capita amount. The grant projects were responsible for programs in the state that now recycle or re-use 2.2 million pounds annually. The program is not static. It has been operating for two decades and while the original grants helped to develop initial recycling programs, the current grant cycle is used to develop more advanced diversion activities including multi-family programs, food waste composting, and green building. The grants are also available for capital improvement purchases. In 2004 to 2005 the grant program supported programs responsible for 16% of the residential recyclables collected in the state.

In addition, considerable research on market development was conducted by the Clean Washington Center (CWC) in the 1990s.[71] According to the CWC, market development has evolved. In the early days, CWC had to carry out underpinning research on the characteristics of materials. The glass industry insisted they could only use a small fraction of recovered glass. The plastic industry said use of recovered plastics was absolutely impossible because of contamination blocking the filters in the remanufacturing process, the paper industry likewise indicated they could use about 20% maximum. In the early days, market development often meant working with industry to develop industry based standards - to avoid fly-by-night operators from producing low quality materials which would harm the entire effort (in areas such as compost). Hence CWC carried out early research to develop and "prove" alternative uses, develop product standards, and develop the ability of close loop to use greater percentages. This was much-needed work, and was a model for market development work and its well-researched studies have been used around the nation.

However, for some time now, individual businesses and organizations have invested in pushing usage forward, and market development is more a matter of finding out what new, innovative usage is occurring elsewhere and identifying if the right economic and market conditions exist to develop that application locally. Market development in a sustainability mode may be more about minimizing risk (as opposed to increasing the reward through artificial financial support).

[71] Interview between Lisa Skumatz (SERA) and David Dougherty (Dougherty Group), former director of the Clean Washington Center (CWC).

Discussions with CWC and other cities, counties, and states involved in market development suggest that the most productive and fruitful roles for a market development organization likely do not include paying for firms to prepare business development plans[72] or entering into situations that may involve long-term subsidies. Instead, more productive roles may include:

- New product testing (to assure a product is fit for purpose if they incorporate recycled content);
- Serving as a facilitator / information source, helping identify sufficient source of recovered materials for a project to move forward;
- Providing lists of firms making products with recycled content;
- Providing sample procurement guidelines and/or bidder's lists for communities; or
- Providing limited term incentives that help encourage use of (local) recycled content products, helping firms that have invested real funds in a product with a real potential market, not paper studies.[73]

Although recycling can and will evolve without some involvement in increasing opportunities to use the materials in the marketplace, well-designed actions can help speed the process.

3.7.3 Nebraska – Creative Funding Options

One interviewee for Iowa reported that, at one point, Nebraska had funded its recycling programs through lottery funds. While we have not had an opportunity to explore this lead, the concept provides an innovative possibility for consideration.

3.7.4 Manitoba Product Stewardship Corporation

The Manitoba Product Stewardship Corporation (MPSC)[74] was established in 1995 as a means to encourage recycling and waste diversion among cities and communities in the Canadian province of Manitoba. It uses the unique system of "gap funding" in which the MPSC helps fund the "gap" existing between the collection costs and revenues of materials in recycling programs for local authorities. This funding mechanism is used to reduce the financial burden of recycling on local authorities while not assisting in garbage collection, thus creating a financial incentive for recycling at the community level.

The "gap" funding is created through the authority of the Waste Reduction and Prevention Act which allows the MPSC to levy assessments upon designated products and materials and collect the funds in a pool. These funds are then distributed to local authorities through Municipal Recycling Support Payments to help decrease the "gap' between the costs of household recycling collection and the revenue generated by the materials collected. The advantage of this system is that it allows for flexibility within communities. The communities may collect any materials in any method they want for recycling, many of which they may be reimbursed for by the MPSC fund. There is no assistance given to the communities for garbage

[72] If the project is not successful, the state or jurisdiction has nothing of value if they subsidize a paper study. In addition, it is important that if any funds are invested, the contract must specify that all elements should be published and not held proprietary, or again, the State gains nothing from the investment.

[73] One example of this harkens from Colorado a few years ago. The State offered grants that matched 75% of the cost of purchasing recycled content products – for instance, parking stops that used recycled tires – for non-profits, schools, or municipalities. In this way, the grant helped move an existing product into greater demand and potentially moved the firm toward economies of scale, and a "product" transferred.

[74] This summary derives from an interview between Lisa Skumatz (Skumatz Economic Research Associates / SERA) and David Dougherty (Dougherty Group) and a summary from the Manitoba Product Stewardship Council (www.mpsc.com)

collection, thus making increases in recycling tonnage collected a more attractive option to communities. Communities may receive reimbursement for up to 80% of their recycling program costs through the MPSC. Each of the past three years in Manitoba have seen a large increase in the amount of recyclables collected. The MPSC website says that "The success of the MPSC Programs is directly dependent upon the participation of all Manitobans. Industry stewards and their consumers fund the system…the regulatory framework is established and enforced by the Manitoba Government…and the general public participates by using local recycling programs diligently."

3.7.5 Western Australia's Diversion Strategies

Australia has a very strong "green" ethic, and has undertaken substantial efforts in recycling and composting. The case of Western Australia (WA) provides several suggestions for how to move diversion forward:[75]

- Western Australia's situation is different than many areas of the US. As it turns out, they have an active wine industry, and compost has significant value as a soil amendment, so local markets help make these diversion efforts cost-effective.
- The best "kerbside" recycling collections in Australia re those in the states that have comprehensive community planning processes, and on-going education media campaigns through mail, newspaper, radio, and television.
- They conducted studies to identify possible markets for packaging, composting, and domestic garbage, C&D, tires, oil, and other materials;
- They created a Landfill Levy Regulation that transferred a surcharge of $6/tonne on landfilled waste to be transferred into a Trust Account to be used as source funding for recycling programs. They recently implemented a Waste Avoidance and Recycling Bill that established an agency to manage waste in WA.
- WA is undertaking a review and study of enacting a container deposit system / bottle bill for bottles and cans.

As a result, Metro Perth reports 45% kerbside collections; as a whole, gaining high diversion across the State has been challenged by the size of the state and long transport distances (up to 3,000 kilometers).

3.8 Summary and Conclusions

The following tables summarize the status of solid waste facilities / infrastructure, and programs and tipping fees, markets, and funding methods in the four states of interest. SERA gathered the information from SERA's in-house database, interviews, web search, and literature review.

Table 3.19. Comparison of Diversion Program / Policy Penetration, Performance, and Costs

Percent of Communities	Colorado	California	Iowa	Oregon
Drop-off Recycling (D/O R)	60-80% said drop-off available; 25%-30% have drop-off only; 40% may have no options for	Nearly all	56%	79%

[75] Derived from interview between Lisa Skumatz (Skumatz Economic Research Associates, Inc. / SERA) and Ray York, Western Australia.

Percent of Communities	Colorado	California	Iowa	Oregon
	recycling (about 10% of population)			
Curbside Recycling (C/S R)	~ 35% of population; 20% of population has C/S service required/paid. 40%-50% of sample towns reported C/S unavailable	88%	69%	94%-98% of incorporated areas.
Drop-off Yard Waste (D/O YW)	~50% occasional**, however, it is not always composted, but landfilled or burned.	90%+ permanent	Nearly all permanent	n/a
Curbside yard waste (C/S YW)	<5%	82%; adding food	n/a	29%
PAYT	<15%	50%	54%	100%
Commercial Programs	Minimal	Advanced / aggressive incl. C&D, audits		Aggressive, including PAYT with embedded recycling in some areas
Source Red'n Programs	Minimal; some master composter training, etc.	Advanced in some areas; zero waste in some		Advanced, including measurement "adders" of 2% toward goal for certain programs
Bans	Half say bans in place	Whole tires, used oil, batteries, white goods, electronics, other	Yard trimmings, whole tires, used oil, lead acid batteries, white goods	Auto, appliances, oil, un-shredded tires, batteries, hazardous from regulated generators
Mandatory garbage service	Close to 30%	Two-thirds reported that collection is mandatory	Mixed (urban tend to require payment)	Rare
Trash service rates	$10-40/mo; avg ~$14/mo	$24.53 average $15.45 min/ $40.28 max	$8-15/mo base; add $5-8 for recycling costs when optional.	$10-21 for30 gal; 13-30 for 60 gal; 13-35 for 90.
Diversion Rate Recycled	12.5%	52%	40%	46%
Recycling Rate	10%	n/a	32%	36%
Table notes	*** 50% have occasional collection of limited materials; collected separately, but ultimately landfilled in many cases.*			

Table 3.20. Comparison of Solid Waste Facilities and Infrastructure

	Colorado	California	Iowa	Oregon
Landfill tipping fees (average, range)	$0-$65/ton; average ~$30/ton (cu yd ranged $0-$12, average $6.75)	$34.10/ton median $85.30 maximum $2.50 minimum	~$33.23 ton	~$35/ton
Number of landfills	72	142	81	28-30 MSW, 4-6 C&D
Landfilled tons	6,932,187	37,764,839	2,187,617	2,685,000
Number of MRFs,	7	58	13	10
Population per MRF	679,000	641,000	226,000	370,000
# Composting facilities	N/A	N/A	8 non-permitted; 16 permitted	44 (2 permitted for food also) (all private)

Table 3.21. Comparison of Markets and Funding Methods

	Colorado	California	Iowa	Oregon
Local markets	According to census, some limited local empl. In iron & steel mills (1100 empl), aluminum sheet (158), plastics, glass (700), and compost	State has active and diverse economy including glass, and other products	Paper, other products	News, occ, plastic, wood, bottle bill glass (cleaner), some PET, some HDPE, some steel
Distant markets	More common to ship out of state	Many ports for distant markets for plastics, metals, others.	Out of state markets for most commodities	Curbside glass (to CA), some PET, some HDPE, other plastic resins, scrap metal (overseas). Have ports.
Funding method	Solid waste user fee surcharge added in 7/1/07	$1.40/ton statewide for planning / program efforts; communities / counties have additional AB939, etc. fees for compliance & programs	$3.25 - $4.75/ton surcharge; If less than 25% diversion, collect $4.75/ton and remit $3.30/ton to state (retain $0.95 for implementation / planning and $0.50 for enviro protection); if 25-50% diversion collect $3.65 / retain $1.45-1.55; if over 50% diversion collect $3.25, retain $1.30. Also $1 for each motor vehicle registration into Tire Management fund.	$1.24/ton surcharge on land filled tons (incl. out of state waste); tax credits at federal level (state ones long time, phasing out 2008)

3.8.1 Key Comparisons and Gaps

A summary of key findings follows, with a focus on "gaps" for Colorado.

Demographics, Economics, and Markets:

- **Incorporation / Population Patterns**: In each state, about 70-80% of the population is in incorporated communities. Average community size, however, varies between states. In each state except Iowa (where the percentage is 7%), the largest community contains about 11-16% of the state's population.

- **Markets**: Access to market differs between the states. California and Oregon are aided by access to ports and international markets, at least along their coasts. Iowa, like Colorado, has greater distance to any but local markets. However, Oregon provided

grants for years that were designed to try to develop more local opportunities and markets, with some success. Access to ports is an important gap in both Colorado and Iowa.

Facilities, Infrastructure, and Costs:

- **Landfill fees**: Landfill fees are similar – around $30-35/ton in all four states. The average size of the landfills (in tons disposed per landfill) varies dramatically from about 27,000 tons/landfill annually in Iowa, to 266,000 tons/year in the average California landfill.[76] Figures for Colorado and Oregon are similar, with 92,000 tons/landfill in Oregon, and 96,000 tons/landfill in Colorado. Tons burned (WTE) relative to disposed in landfills ranges is about 1.2-1.5% in California and Iowa, and is more than 6% in Oregon. The figure for Colorado is well less than 1%.

- **Household Trash Bills**: Household trash rates are generally similar, with all showing rates in the $10-20 range for most communities, with California rates hovering closer to $25. However, in California and Oregon, the fees include recycling; that is generally not the case in Colorado.

Policies and Legislation:

- **Bans**: All states have some bans at the local or state level. Oregon, California, and Iowa have bottle bills. This may be considered a gap for Colorado in that capture of containers is higher in bottle bill states.

- **Mandatory Garbage**: There is considerable variation in the presence of "mandatory" garbage collection (really fees). It is rarer in Colorado and Oregon than in California and Iowa.

- **Quick Summary Characterization of State Legislation**:
  - California: each community must meet 50% landfill diversion goal or pay $10,000/day penalty.
  - Iowa: 50% diversion goal; communities not meeting goals must advertise failure to meet goal, must put in PAYT program, must pay higher landfill surcharges, and other.
  - Oregon: Legislation provides list of 8 specific Best Management Practices (BMP); small communities must implement fixed number; larger communities must implement a larger number. State establishes goals, with lower diversion goals for rural counties than urban counties.
  - Colorado: no requirements / no similar legislation (gap).

Recycling Programs, Incentives, and Performance:

- **PAYT& Recycling**: All states save Colorado have significant PAYT penetration (50%-100%) and high shares of curbside recycling programs (70%-88%+). Colorado's percentages are fewer than 15% with PAYT and around 25% curbside recycling – dramatically lower and a gap in performance compared to the other states.

[76] Computed, obviously, as landfilled tons divided by MSW landfills for the state.

- **PAYT Legislation**: PAYT legislation exists in Iowa and Oregon; PAYT is required in Iowa for all towns not achieving 25% diversion, and Oregon includes PAYT as one choice on a limited list of BMP. California has a diversion percentage requirement with a strong fiscal penalty. When PAYT is in place, Colorado uses local ordinances to require PAYT (and/or provides by municipal service or contract). This is a significant gap in incentives for diversion in Colorado.

- **Recycling Access**: Fully 40% of Colorado communities said there was no access to recycling in their area. 27% said they had drop-off recycling available, and about 25% may have curbside programs (about 20% of communities). This is a significant gap for Colorado. Access to recycling is the name of the legislation in Oregon, and it is key. More than 95% of incorporated areas have curbside programs, and 80% have drop-off programs. Iowa has widespread drop-off and curbside programs (56% and 69%, respectively). California communities have at least drop-off programs, partly because state law even mandates how close a drop-off site must be to every resident (with radii calculated). Almost 90% of communities have curbside recycling in California.

Yard Waste Access:

- **Curbside**: Yard waste programs are in place in most California communities. These programs were the key in moving California communities up to and beyond the first regulatory threshold of 25% diversion. These programs are less common in Oregon (perhaps 20-30% of communities[77]). Virtually no Colorado communities had regular collection of yard waste, although Boulder is expected to soon have such a program. This represents a "gap" for Colorado.

- **Other Yard Waste**: Nearly all communities in California and Iowa have drop-off yard waste opportunities.[78] About half of the communities in Colorado indicated they have special seasonal compost collection events; few have full-time yard waste sites available (Boulder and a few others). Although some of the Colorado communities said they mulch (and fewer compost) the materials, many of the small communities in Colorado noted that they collected it separately, but landfilled or burned the materials. This represents a "gap" for Colorado.

Extended Efforts:

- **Commercial**: Given California's aggressive legislation, strong community efforts have been undertaken in the commercial sector, including construction / demolition / landclearing debris diversion programs, foodwaste programs, waste audits / technical assistance programs, and in some cases, aggressive source reduction program development for the commercial sector. Communities in Oregon have also implemented waste audits / technical assistance programs, mandatory recycling plans for businesses, construction and demolition programs, and other efforts. Iowa community efforts in this area are still to be explored. Very limited commercial recycling efforts are in place in Colorado, with the exception of Aspen's PAYT with embedded recycling fees, Boulder's 3 months-free program, Fort Collin's climate wise efforts, and a few others. This represents a gap for Colorado.

[77] Although we are checking these figures, and are also working on Iowa figures on yard waste.
[78] We are clarifying this figure for Oregon.

- **Source Reduction**: Other than PAYT (which automatically leads to residential source reduction), there have been only limited efforts in developing residential source reduction programs. Communities in California have adopted zero waste goals and are implementing varied efforts, and Oregon undertook several efforts to try to measure source reduction from programs like backyard composting. As a simplification, they now assign a "deemed" diversion rate percentage adder for communities undertaking serious and reasonably-designed programs of this type (usually about 2% adder). This represents a gap for Colorado.

Funding:

- **Recycling funding**: Among these states, tipping fee surcharges (and associated grants and rebates) have been the source of funding for most of the planning efforts. Some states also fund programs through these funding sources; however, other states explicitly expect that the costs of the programs will be funded through on-going user fees. California communities received explicit legislative rights to add additional fees for funding these programmatic efforts as well. These funds have generated millions of dollars annually. This represents a gap for Colorado.

In addition, some creative elements from legislation in other states were presented and reviewed, including: Wyoming planning requirements, and creative funding methods used in Washington and Nebraska. A summary is provided in Table 3.22.

The next Chapter reviews:
- barriers and opportunities,
- examines estimates of diversion by program type to advise on cost-effective designs;
- implications for potential diversion for Colorado,
- effective "drivers" leading to program adoption in other states,
- funding issues, and
- implications and recommendations for Colorado.

Table 3.22. Summary of Major "Gaps" in Colorado's Solid Waste and Diversion Situation

Category	Gaps
Demographics, Economics, and Markets	No critical differences in population or industry patterns. However, California and Oregon have access to ports that are not available to Iowa or Colorado. All three other states have greater access to significant industries that can use recycled materials, especially paper. Iowa also noted its rail lines helped deliver product to market.
Facilities, Infrastructure, and Costs	Landfill fees are similar ($30-35/ton), so differences in avoided cost are not the drivers for differences in the presence of recycling and diversion. Household trash bills are also fairly similar; however, unlike Colorado, the bills in the other states generally include recycling.
Policies and Legislation	The states have varying levels of bans; Iowa's bans include yard waste, white goods; all the states ban basic tires, batteries, hazardous materials, etc. The three other states have bottle bills, which several states indicated were important to their strong diversion performance and recycling ethic. Mandatory trash service is less common in Colorado and Oregon than in California and Iowa. Most importantly, all the other states have state-level legislation with diversion goals, and program, policy, or performance requirements for communities and/or landfills in the State, The legislation was a significant "driver" for program adoption across these states.
Recycling Programs, Incentives, and Performance	Colorado lags far behind the other comparison states in both curbside and drop-off recycling access. 40% of communities covering at least 10% of population say no options are available. Curbside recycling is available in about 50% of communities but it is not mandatory and it usually costs extra (not embedded in the trash rates); thus, participation is likely much lower. Colorado also lags behind all three other states in adoption of PAYT, which has served as a strong driver for household diversion.
Yard Waste Access	Yard waste drop-offs and collection programs are rare in Colorado (especially compared to California (where curbside is the norm) and the other states (where drop-off is common). Colorado's programs are often occasional (Holiday trees) and most egregiously, the materials, while collected separately, are often landfilled or burned.
Extended Diversion Efforts	California and Oregon have extensive commercial programs, and both states have actively pursued source reduction efforts in the residential and commercial sectors. Colorado, with only a few notable exceptions (Aspen, Fort Collins, and to some degree, Boulder) has few efforts in the commercial sector, in source reduction or other efforts.
Funding	Tipping fee surcharge mechanisms and associated grants and rebates have been used to help fund planning efforts. Program funding in Oregon is almost exclusively through trash / recycling bills. Program efforts in California are somewhat underwritten by increased taxing authorities granted to communities along with the legislation. Colorado has a limited grant fund available; however, it is not sufficient to support either state-wide planning efforts, or for ongoing programmatic funding.
Conclusion / Recommendation	Recycling did not spontaneously arise in these other states. Legislation and statewide initiatives were key drivers. Several steps are needed to move recycling and diversion forward in Colorado:[79] • Legislation at the State level to adopt a goal and require planning, education, recommended "best management practices" (including PAYT), reporting, measurement, enforcement, and funding; • OR Encourage adoption of local ordinances that establish a level playing field for all haulers operating in the community or county, requiring access to threshold / defined recycling programs, cost of programs embedded in the trash rates (and potentially PAYT), education, and tonnage reporting. The State might consider encouraging adoption by providing favoritism for grants for those communities implementing such legislation.

[79] The next chapter addresses specific legislation requirements, and also provides information on the types of recycling and diversion program designs that are most cost-effective (once a community or hauler decides to move forward with programs, perhaps at the nudging of local or state-wide legislation).

4.0 ANALYSIS OF BARRIERS, ENABLERS & DRIVERS FOR DIVERSION FOR COLORADO

4.1 Introduction

The previous chapter examined the context for and availability of recycling and diversion activities in each state. The analysis found significant "gaps" in Colorado, including:

- Local markets
- Bottle bills
- State legislation on PAYT (plans / program requirements)
- PAYT penetration
- Local PAYT legislation
- Recycling access – with significantly fewer curbside programs as well as drop-off programs, and 40% of Colorado communities stating they had no access to recycling.
- Yard waste program access – curbside and drop-off
- Commercial recycling
- Source reduction programs
- Recycling funding

As a result, the overall diversion performance for Colorado (about 12% in 2006 according to *BioCycle*) relative to that in the other states researched – 40-52% -- can be understood. The question is, can it be remedied?

This chapter assesses top drivers, barriers, and opportunities for increasing diversion in Colorado, based on the information from the previous sections, and develops recommendations for strategies to move diversion forward. The remainder of the chapter then examines the impacts from increasing diversion in Colorado, including diversion options and economic development implications for the State.

4.2 Reports of Top Drivers

Interviews with other states found nearly uniform responses regarding the top drivers for increasing recycling and diversion in their state:

- Legislation, with goals and measurement;
- Funding; and
- The convenient curbside and other programs that these elements facilitated.

According to the states, other contributing drivers include:

- Bottle bill legislation;
- Subtitle D landfill legislation; and
- In Oregon, they believe green attitudes and a consciousness of resource conservation were critical drivers. (Coloradoans potentially have a green ethic that could be energized).

Some states had natural advantages that distinguish them somewhat from Colorado.

- Certainly, having both local markets and ports helped Oregon and California; and

- All three of the other states had adopted bottle bills, which can raise the consciousness of recycling at the household level.

However, all have tipping fees similar to Colorado's, and each has significant rural components, private haulers, with perhaps Iowa's situation being the closest in character.

None *of the states had compelling economics, natural adoption, or similar market forces attributed with any significant role in moving recycling forward. This is one case in which the "invisible hand" touted by economists fails in incorporating the externalities associated with waste management into the market. Instead, policy choices are needed if a change in action is desired. In each of the other states, a political decision by a willing Governor and legislature was required to bring the circumstances around to spur program development. Economics alone – even market development efforts[80] – have not been able to "create" or correct the market omissions and issues associated with solid waste management.*

4.3 Barriers and Opportunities

A key effort of the interview process was to identify possible perceived barriers to recycling and diversion in Colorado. The most common perceived barriers to recycling were reported as:

1. Geography and Access
2. Economics
3. Lack of options
4. Education
5. Multiple un-regulated haulers

We address the standing of each of these five barriers in the three comparison states, and then address the status in Colorado, along with possible remedies.

4.3.1 Barriers: California

California has relatively few important barriers to recycling. Perceived barriers elsewhere don't apply to most of California, except possibly some communities in the extreme north or the mountains or inland (near Nevada).[81] The most common perceived barriers to recycling across all the states are listed below, and the status for California is detailed.

1. Geography and Access: The State has exceptional access to markets both within the State and, through its many ports (including San Francisco, Oakland, Los Angeles, and San Diego), ready access to overseas markets. The State has a robust and varied economy (see Chapter 2) that can use and/or export a wide variety of recycled materials. The State's legislation required at least one bottle redemption area be located in each "convenience zone" and sets forth minimum hours that the centers are open (at least 30 hours a week).

[80] Market development efforts in other states have varied dramatically. They have been small scale (grant programs for individual issues/projects); medium scale (incubation efforts) and larger scale (recycling market development zones and tax benefits). Frankly, most have proven to be disappointing, except perhaps the smaller efforts. So far, no communities in California with RMDZ have demonstrated significant effects.

[81] Even so, the distances (to market) are shorter than many faced by Colorado communities.

2. Economics: The AB939 legislation dramatically and instantaneously adjusted the economics of recycling: a potential $10,000 per day fine makes a wide array of recycling programs more affordable.
3. Lack of options: The AB939 legislation led to adoption of a wide variety of programs in the vast majority of communities.
4. Education: At the State level, the Department of Conservation (DOC) has sponsored award-winning advertisements regarding recycling and the deposit legislation. Virtually every community has also instituted web sites and advertising programs to educate the public on programs, recycling, diversion, and in many locations, even zero waste. The State's nationwide "green" reputation has also helped program adoption and acceptance.
5. Multiple un-regulated haulers: The "norm" in California is franchised private haulers operating in efficient geographic areas in communities. The haulers are required to offer programs, and this represents a business opportunity for the haulers. The Cities charge franchise fees – often in the range of 10-30%, and use the funds to finance the array of programs needed to try to reach goal.

4.3.2 Barriers: Iowa

Iowa faces barriers, but seems to have been able to address them with their programs, facilities, and legislation. Regarding the list of perceived barriers that face many states, Iowa's situation is summarized below.

1. Geography and Access: The State appears fairly isolated from markets, but is, in fact, close to paper end-users and users of several other products (see economic data in Chapter 2). The state legislation has led to the adoption of widely dispersed drop-off programs, as well as curbside programs in the vast majority of communities. PAYT is common.
2. Economics: The tip fee surcharge (sliding scale) has assured a sufficient funding source for programs, and improves (at least somewhat) the economics of recycling and diversion.
3. Lack of options: Curbside, drop-off recycling, and yard waste programs are commonplace. Further, there is a statewide bottle bill.
4. Education: The cities have been very active in program education.[82] In addition, the Statewide bottle bill raised the education and awareness level of recycling.
5. Multiple un-regulated haulers: The hauling situation in Iowa is varied. Some communities use municipal collection, but private haulers operating via license, and a few contracts, etc. are in place.

4.3.3 Barriers: Oregon

Oregon, like the other states, had a number of initial barriers to recycling but over the past two and a half decades has crafted measures to overcome both the perceived and actual barriers.

1. Geography and Access: The state's law is called "Opportunity to Recycle" and access is a key requirement. The state has some remote areas (the Eastern high desert areas /

[82] See a study on education within the State (and beyond). Skumatz, Lisa A., Ph.D., and John Green, 2001. "Estimating the Impacts of Education…", prepared for Iowa Department of Natural Resources, Skumatz Economic Research Associates and Econservation Institute, Superior, CO.

rural counties), but the vast majority of the State's population is clustered along the coast and the Portland area, with its access to ports and international markets.

2. Economics: The economics of recycling in Oregon – especially along the coast – is greatly assisted by the presence of ports. In addition, the State has paper mills looking for product, which have also been significantly aided by the recycled content mandates in California. The presence of multiple single stream MRFs in the Portland area has led to price competition to attract product, which further helps to increase diversion by haulers.[83] The economics of recycling at the household level is improved by the 100% presence of PAYT.
3. Lack of options: Opportunities to recycle are widespread, with nearly universal coverage by curbside and drop-off residential recycling and yard waste programs, and aggressive actions, particularly in the Portland region, in the commercial and source reduction fields. The longstanding bottle bill, which predated the Opportunity to Recycling legislation and the widespread programs, provides well-recognized options for recycling.
4. Education: Education is widespread in Oregon. Further, state officials contend that programs followed consumer resource conservation awareness / green ethic, rather than the other way around. Again, the bottle bill provides an education opportunity as well.
5. Multiple un-regulated haulers: The State has many haulers (at one point, Portland alone had more than 100). Most of the State now operates as a franchise system, using an indirect system in which the government sets the rates. State law requires all haulers are required to offer PAYT with recycling embedded in the fees. The public is agreeable to the system, and no one complains about paying for recycling. The recycling requirements are perceived to provide a business opportunity for the haulers, providing more revenue (and the cities then receive a franchise fee on these revenues which help pay for additional programs). Haulers receive higher revenues and the regulations represent a level playing field. The companies do both garbage and recycling collection.[84]

4.3.4 Barriers: Colorado

This topic was especially critical for Colorado. The summary of findings for the five issues is provided below – along with potential methods of addressing the barriers.

1. Geography and Access

There are two closely related barriers associated with geography and location, the first is the geographic isolation of the community and the second is the location and access to drop-offs within the community. Many of the communities interviewed were located in geographically isolated areas, whether they were mountain towns, eastern plains communities, or western slope communities, these towns reported that their isolation and the associated costs incurred in the transportation of materials were barriers to their recycling effort. Many of theses smaller towns were serviced by one of the non-profit co-ops in the state and the only available recycling for residents are the drop-offs provided by these co-ops. However, through interviews with the co-ops it was discovered that the large ranges they service, increased fuel costs, and distance to processing facilities are an on-going barrier to success. Some of the interviewees reported that:

[83] Although it complicates the issue or product quality.
[84] The service provider is split in only one location – Milton-Freewater, where the City provides garbage service.

- *Geographic isolation is the largest barrier- we have a limited ability to process and ship materials and there are high transportation costs.*
- *The distance to recycle is too far.*
- *Until Yampa (Yampa Valley Recyclers) came here people had to drive over 30 miles to drop-off. The program just started in the fall of 2007 so we can't be sure it will stay around.*
- *The price of fuel is too expensive.*

Possible Solutions:

Grant funding to support existing non-profit co-ops and support of the co-op program for rural areas where it does not exist. The co-ops, which have been successful in many of the rural areas of the state and in a number of towns, are the only viable option for recycling. One town reported that they would like to be included in the co-op but that the county could not afford it. (Per capita annual cost of $0.96). Grant funding could help to cover fixed transportation costs of these programs or assist in the establishment of rudimentary baling and sorting areas for recyclables. Few, if any, non-profit grants are focused on capital for equipment. By sorting and bailing materials the efficiency of the collection and transportation could be increased.

For residents in the communities the location of the drop-off was reported as a barrier. Some towns reported that residents have a long drive to access a drop-off and limited opportunities to do so. Additionally, interviewees reported that only dedicated recyclers would be willing to bring their own materials to a distant drop-off area with the high fuel costs and inconvenience associated with the drop-off. Some of the comments regarding drop-off areas were:

- *We have a high elderly population and it is very hard for them to collect and bring recyclables to a drop-off area, especially if it is very far. Wind is also an issue.*
- *People have to drive a long distance to the drop-off*
- *We are an aging town that is far from anything, there are no options locally and it is very inconvenient to bring materials to drop-offs far away.*
- *It is inconvenient to bring materials to the drop-off area. Also we need more barrels at the drop-off area.*

Possible Solutions:

Grant projects to support both town operated drop-offs and support for non-profit co-ops to establish more drop-off areas. A number of towns expressed the desire to have a public site for recycling drop-off that accepts more material. In some cases the only available drop-off is at a grocery store and only accepts cans. Town drop-offs could be operated like the proposed Bayfield drop-off which will be open only two days a week and manned to reduce contamination and mess.

2. Economics

Economics are involved in almost all of the listed barriers. The increased cost of transportation due to location, the cost of providing education materials, the increased cost of the optional curbside service provided by private haulers, the lack of economic incentives to recycle (i.e. a

landfill with no tip fee in Otero County or unlimited trash collection for a flat fee) and the lack of funding to start up new programs in the town or city.

Possible Solutions:

Colorado has taken the first step to alleviating this barrier, With the passage of HB 1288 the state has created a commission to award funding to programs that will increase recycling and diversion.

3. Lack of Options

The lack of options to recycle was mentioned in a large portion of the interviews as a barrier to recycling. However, these towns were usually significantly smaller in population and represent only a limited portion of the Colorado population. These were towns with either no drop-off options, or ones where drop-off was available but for only a limited number of materials. Some of the comments regarding the lack of available recycling opportunities were:

- *Recycling options are not readily available. There is no way to recycle anything other than aluminum cans.*
- *There are no options for recycling available.*

Possible Solution:

It should be determined whether these are perceived barriers where there is an opportunity to recycle and the town and residents are not aware of them, or whether these are real barriers and there are no recycling options in the town. Other sections of this report suggest various programs to increase the opportunity to recycle including legislation, funded mandates, support of non-profit co-ops, and funding for drop-off areas.

4. Education

Even in towns that have drop-off areas or the option of curbside collection, the interviewees reported that a lack of education among residents was a barrier. The need for education was reported as a means to tell residents how and where to recycle as well as the benefits of recycling and overall sustainability.

Possible Solutions:

Support of education programs both statewide and locally. Mailers, web based campaigns, and especially recycling education in schools can be effective in disseminating information on how, what, and where to recycle. By educating children on recycling it not only helps to make the parents recycle but can also create lifelong habits for recycling and diversion.

5. Multiple Un-Regulated Haulers

Nearly two-thirds of the communities reported that they had multiple haulers collecting trash and/or recycling in their community and 10% of the interviewees said that this was a barrier to diversion. By having multiple residential haulers with different rules, some offering curbside recycling for an extra fee and some not offering the service, there is often no economic incentive

for residents to choose to recycle. Additionally, towns reported that with multiple haulers what can be recycled is constantly changing, confusing residents about how to recycle, and sometimes even discouraging them from completing the action. In addition, having multiple haulers covering the same areas leads to cost inefficiencies that make recycling impractically expensive. Contracting poses another option for communities to move recycling forward.

Possible Solutions:

Using the models of Fort Collins, Boulder, and Aspen cities can craft local ordinances (or the state could work create state-wide legislation) requiring haulers to incorporate Pay-As-You-Throw rate structures with recycling costs embedded as a condition to obtaining licenses. These two licensing conditions combine to create an economic incentive for residential recycling while maintaining a level playing field for all haulers without dictating their rates.

4.4 Overall Strategy Options and Recommendations

Colorado ranks low in recycling, according to *BioCycle*'s 2006 survey. Thanks to the activities in about a half dozen communities in the state, recycling was estimated at about 12.5%.[85] The rest of the State has low performance, and according to the survey data cited in this report, 40% of the communities in the State claim to have no access to recycling at all.

The State of Colorado has a potential window for action, with Statewide attention moving toward the environment, and momentum and coalitions from last year's passage of HB1288. This report reviewed drivers and lessons from other states that have moved forward in recycling.

If the goal is to increase diversion, the methods are clear– amend the gaps in:

- Curbside recycling
- Drop-off recycling
- Curbside yard waste
- Drop-off yard waste
- Broaden PAYT penetration
- Ensure basic, large value commercial recycling
- Educate on diversion / recycling
- Potentially a bottle bill.

These changes bring immediate effects, as shown in the table below.

[85] Including Loveland at 50% diversion, Boulder near 40%, Fort Collins at 25%, Broomfield at 20%, and Denver at 10% but aiming for 30%.

Table 4.1 Estimated Impacts from Key Diversion Programs/Policies/Activities[86]

Activity	Impact	Notes / Discussion
Curbside recycling	10-20+%	Varies based on commodities, collection frequency, containers and collection methods and other factors. Higher with single stream; much less expensive if collected fortnightly but lose some material diversion.
Drop-off recycling	3-10%	Can perform well in rural areas, especially if placed in destination areas like grocery parking lots. Advertising to multifamily buildings can help.[87]
Curbside yard waste	15-25%	Varies based on growing season and cost of program.
Drop-off yard waste	2-10%	Varies based on convenience
PAYT	6% - 17%	PAYT dramatically improves capture from curbside and drop-off yard waste and recycling programs. Leads to significant source reduction / generation avoidance.
Commercial recycling / large value items; possible technical assistance / education	N/a	Impact depends on amount already recycled, business mix, etc.
Education	1-3%[88]	Increasing expenditures on education and public outreach and student programs has a measurable effect on diversion.
Bottle bill	TBD	All bottle bills (deposit legislation) are not created equal. Some perform better than others; some certainly have far greater administrative burden than others. There are strengths and weaknesses.
		Source: Skumatz/SERA, 1995, 1999, 2000, 2001, 2004, 2006

4.5 Overarching Recommendations to Move Diversion Forward in Colorado

Undeniably, the analysis of the experience of the other states indicates that without legislation, funding, and monitoring, little will happen. Thus, in discussing or identifying the "enablers" or drivers, it is not sufficient to stop with "curbside recycling" – the "direct" drivers. The drivers to support the climate for adopting "curbside" also need to be discussed.

There are several key elements that must be considered in developing strategies and recommendations for increasing access to recycling and diversion in Colorado:

- Colorado's communities differ – flexibility and a consideration of differences is a key to success
- Funding, sustainability, and equity must be a key consideration
- Broader effects than diversion are important, including economic development effects.

Recommendations should be mindful of differences in size, economics, and situation for communities in the State.

[86] Skumatz, Lisa A., Ph.D., 1996. "Nationwide Diversion Rate Study - Quantitative Effects of Program Choices on Recycling and Green Waste Diversion: Beyond Case Studies", Skumatz Economic Research Associates, (SERA), Superior, CO; Skumatz, Lisa A., Ph.D. 1999. "Achieving 50% in California: Analysis of Recycling, Diversion, and Cost-Effectiveness", prepared for California Chapters of SWANA, Skumatz Economic Research Associates, Inc. (SERA), Superior, CO, and Skumatz, Lisa A. articles in *Resource Recycling* including 6/99, 8/99, 9/99, 8/00, 6/01, 8/01, 7/02, 8/02, 9/02, 10/02, 8/04, 9/07.

[87] Note, our strategy for Colorado does not focus on multifamily recycling. This has consistently proven to be a more difficult program to implement well, and we believe it is a strong second-round plan of attack, but not first round. It might, for instance, be the focus of a grant round later on.

[88] Source: Skumatz, Lisa A. and John Green, 2001. "Measuring Impacts from Education…", prepared for Iowa Department of Natural Resources, Skumatz Economic Research Associates and Econservation Institute, Superior, CO.

The analysis leads us to several overarching recommendations to help "drive" recycling in the State of Colorado:

- *Introduce state-level legislation with key requirements related to goals, best practices, measurement, enforcement, education, and funding, OR*
- *Help cause local jurisdictions (communities and counties) to adopt local ordinances that require: access to (curbside) recycling; recycling fees embedded in trash rates; PAYT rate structure (preferred); education; and hauler reporting to allow measurement of progress.*
- *A grant program designed to foster sustainable recycling and diversion and overcome recycling barriers in Colorado;*
- *Identify and "lock in" a long term local or state funding source that supports these objectives.*

Each of these recommendations is developed further in the following sections, but the key strengths are summarized below:

- **State-level**: State-level legislation is probably the best state-wide solution to the situation. It minimizes within-state variations, and assures more equivalent access to programs state-wide. Funding options at the state level are more robust. Flexibility can be written into the statutes to provide differential treatment for large vs. small, urban vs. rural communities (*a la* Oregon). However, state-level legislation can take a long time.

- **Local ordinances:** Local ordinances can be passed in months-long time frame. The local ordinances can be passed at the city / town and county level, and examples exist within the State (Fort Collins, Boulder, Boulder County, Loveland, Aspen, Superior, elsewhere). Ordinances provide the "level playing field" so important to haulers (the major service providers in the State). These can be put in place in the near-term, and minimal disruption will likely arise, even if later, state-level legislation is implemented. Rate-setting is not allowed, but PAYT rate structures, naming rate differentials, can be specified.

- **Grants**: Several of the states that were interviewed had overseen grant programs designed to address barriers to diversion within the State. The interviews provided several elements of successful grant programs:
    - Grants should be used to address barriers, but should not generally lock the agency into long-term subsidization of a program that will not be sustainable long-term.[89]
    - Market development grants should be geared toward the following roles: new product testing (to assure a product is fit for purpose if they incorporate recycled content); serving as a facilitator / information source, helping identify sufficient source of recovered materials for a project to move forward; providing lists of firms making products with recycled content; providing sample procurement guidelines and/or bidder's lists for communities; or providing limited term incentives that help encourage use of (local) recycled content products, helping firms that have invested real funds in a product with a real potential market.[90]

[89] However, some transfer to close-to-supportable rural areas may make sense to broaden accessibility to recycling in a very dichotomous state (very urban along a corridor vs. very rural elsewhere) – especially given the low investment needed for some of these programs. Depending on the funding source, this may qualify as redistribution.

[90] One example of this harkens from Colorado a few years ago. The State offered grants that matched 75% of the cost of purchasing recycled content products – for instance, parking stops that used recycled tires – for non-profits, schools, or municipalities. In this way, the grant helped move an existing product into greater demand and potentially moved the firm toward economies of scale, and a "product" transferred. Providing grants to aid situations / firms / communities that have already provided "skin in the game" (as it was put by a Task Force" meeting attendee) can provide assistance to move recycling forward.

- **Funding for Grants**: A long-term, sustainable source of funding should be identified in support of these efforts. With a long term grant program, the program will be around for various generations of efforts in the state. Some programs will be ready fairly soon; others may take 2-5 years or more to become "ripe". A program that allows all jurisdictions that are paying into the fund to believe they may see something out of it can prove a powerful motivator. Most states used some version of a landfill surcharge, which helps recognize that both landfilling and diversion are part of the same overall solid waste management system.[91]

Although recycling can and will evolve without some involvement in grant programs that address barriers or increase opportunities to use the materials in the marketplace, well-designed actions can help speed the process.

Overarching recommendations to "drive" recycling in the State of Colorado:

- *Introduce state-level legislation with key requirements related to goals, best practices, measurement, enforcement, education, and funding, OR*
- *Help cause local jurisdictions (communities and counties) to adopt local ordinances that require: access to (curbside) recycling; recycling fees embedded in trash rates; PAYT rate structure (preferred); education; and hauler reporting to allow measurement of progress.*
- *A grant program designed to foster sustainable recycling and diversion and overcome recycling barriers in Colorado;*
- *Identify and "lock in" a long term local or state funding source that supports these objectives.*

The following summarizes the prioritized recommendations for Colorado, given the research from other states.

4.5.1 Summary / Elements of Strategies for Recommended State-Level Legislation

This section summarizes the elements of recommended strategies for State-level legislation to move recycling and diversion forward in Colorado, and essentially combines elements of Oregon, Iowa, and Wyoming legislation.

Authority/Organization and Goals:

- Responsible entity: Cities and counties (for unincorporated areas and any cities not wanting to set their own plan). Encourage responsible parties to join together and develop regional plans.
- Goal: Lower goals for counties with population density lower than 240 persons per square mile, and higher for areas with greater densities. Suggestions:[92] 13% / 33% for the first threshold, increasing to 20% / 40% after 5 years.[93]
- Requirements:
    - The responsible entity, either cities, counties or an amalgamation working together, must develop a comprehensive solid waste management plan (15 year horizon) with 5 year updates.

[91] Despite 20 years of concern that this funding method would be a decreasing source of funds – a "death spiral" as disposed tonnages decreased and recycling increased – no programs to date have experienced this outcome. A few states added specific local taxing authorities, one interesting option taxed the first owner of toxic sales within the state, and another may have used lottery funds.

[92] Goal may also be set in pounds per capita.

[93] Note we do not establish a statewide or county wide goal of zero waste. Nothing in this legislation would preclude communities from adopting or implementing such programs, and perhaps grants could be encouraged for to assist with these strategies.

- The legislation should list a "menu" of at least 7 potential waste diversion and reduction strategies. The suggested list of these strategies should include 1) establishment of recycling drop-offs at least 1 per X000 residents collecting at least newspaper, cardboard, HDPE, PET, aluminum cans, glass, steel cans; 2) curbside recycling at least fortnightly on same day as trash with container at least 64 gallons, no separate fee, collecting at least newspaper, glass, HDPE, PET, aluminum and steel. 3) education program; 4) collection of at least 4 materials for Multifamily; 5) effective yard waste program including promotion; 6) commercial recycling including at least cardboard, office paper; 7) PAYT or area-wide PAYT ordinance with smallest container no larger than 32 gallons (maybe 21 gallons), requiring 75% incremental rate increase for each level of service (i.e. 1 can, 2 can, 3 can levels of service), and hauler reporting.
- Small communities (<4,000) or communities in areas with county densities less than 240 persons per square mile must implement the drop-off option plus at least one additional program; or must meet the goal through programs of their own design.
- Larger communities or communities in areas with county densities more than 240 persons per square mile must implement the drop-off and curbside programs and two others, or must meet the goal through programs of their own design.

Funding for Planning and Programs: Multiple funding sources are recommended to diversify, collected at state level.

- Fee on first ownership of toxic materials in the state (per Washington State)
- Increase in landfill tip fee

Dispense the funds to the cities and counties / responsible entities as follows:

- For comprehensive plans – 33% of cost if 1 entity plans alone; 50% if plan with 2 agencies; 75% if plan is developed in conjunction with 3 agencies.[94]
- Grant program with simple application process specifically to set up rural cooperatives and drop-off truck routing systems
- Separate grant program with more detailed application process, funding program capital for approved programs, or for new programs, or for needed infrastructure. In addition, provide focus grants for program, technologies, or infrastructure associated with a waste stream or other need identified through state or other research.

Monitoring and Enforcement

- Communities and/or counties are responsible for gathering and reporting the following data to the State on an annual basis:
  a) Tonnage to landfill in base year (perhaps 2007)
  b) Tonnage to landfill in new year
  c) Tonnage diverted from programs 1, 2, 4, 5, (6), above separately, plus any other programs implemented in combination
  d) Tonnage per capita disposed and diverted
  e) Landfill diversion percentage and tons per capita diverted from base year.
- State gathers and posts the data on-line using Re-Trac™[95] . If the sum of the elements of c meets the goal, the community meets goal, and the community is in compliance. The State should periodically audit tonnage reports.

[94] Possibly insert reimbursement maximum amount.

[95] See Appendix. Re-Trac is an affordable "off the shelf" software solid waste database management package that provides easy reports, and would cost the state about $15-$20K.

- If community is not in compliance, it must:
    - Implement PAYT or if that is in place, implement one more program from the list
    - Conduct a review of the programs in place in concert with the State staff, and identify any issues with program performance and propose remedies.

Education

- State should fund statewide education at a funding level of approximately $1.00 per household per year. The state may elect to conduct the education program, or allow communities to request the funds for their community outreach up to the maximum of $1 per household per year. Leftover funds should be allocated to the grant program.
- State should sponsor workshops and establish a website geared toward helping communities with sample ordinances, contracts, PAYT materials, peer match to state and other communities with programs of interest, etc.

4.5.2 Summary / Elements of Strategies for Recommended Local Ordinances for Colorado

Local ordinances are flexible and powerful – and can be quick to implement[96]. Many of the key elements of ordinances parallel the construction of the state legislation recommendations. The most effective ordinances will incorporate the following elements to move residential diversion forward:

- **Define threshold recycling service**: The ordinance should specify that households be provided with a container that is 64 gallons or larger,[97] collected fortnightly[98] or weekly, and that at least 5-7 key materials must be collected: mixed paper, newspaper, cardboard, steel cans, aluminum cans, and potentially glass and #1 and #2 plastics.[99]

- **Recycling embedded in trash fee**: There is no comparison between recycling participation for mandatory / fee-embedded vs. optional / extra fee programs. Recycling that is available to all with trash service, with the fee embedded in the combined garbage and recycling bill, leads to high recycling rates and cost-effective programs (because recycling costs reach economies of scale and are divided across all households).

- **Pay As You Throw (PAYT) rates**: PAYT rates – incentives that charge higher fees for collection of larger volumes of trash from the household -- are the single most effective element that can be added to increase the participation, tonnage, and retention of recycling

[96] A number of local ordinances can be viewed and downloaded on the website: www.paytwest.org

[97] 64 gallons is recommended because larger containers lead to higher recycling diversion and the small, open, 18 gallon "bins" are commonly overflowing in quality programs. .

[98] We recommend fortnightly collection as a viable option because there is only a small decrease in diverted tonnage from a switch between weekly vs. fortnightly collection, but the cost of the program is about 40% less with fortnightly collection. (Skumatz and Freeman, ""Alternating weeks: Options and opportunities for garbage and recycling. Can every other week provide greater efficiencies and incentives for the future?" *Resource Recycling*, September 2007. See also Skumatz, Lisa A., Ph.D., 1996. "Nationwide Diversion Rate Study - Quantitative Effects of Program Choices on Recycling and Green Waste Diversion: Beyond Case Studies", Skumatz Economic Research Associates, (SERA), Superior, CO; Skumatz, Lisa A., Ph.D. 1999. "Achieving 50% in California: Analysis of Recycling, Diversion, and Cost-Effectiveness", prepared for California Chapters of SWANA, Skumatz Economic Research Associates, Inc. (SERA), Superior, CO, and Skumatz, Lisa A. articles in *Resource Recycling* including 6/99, 8/99, 9/99, 8/00, 6/01, 8/01, 7/02, 8/02, 9/02, 10/02, 8/04, 9/07.

[99] Glass bottles and plastic bottles are both attractive commodities that can be processed at most MRFs in the state, and thus would likely be also included in most communities. However, if glass is perceived to be a problem, an analysis of materials commonly collected curbside implies that 88% of the weight of material is collected if glass is omitted, and the combined materials retain about 95% of their value.

behaviors (households are reminded to recycle every time they get a bill).[100] The ordinance should require that the rate *structure* (the ordinance cannot assign the rate *levels*) should increase on the order of 80% (or more) for double the service. That is, if one can is $10/month, two cans should be $18.00/month or more, and the pattern should be retained for higher service levels.[101]

- **Education**: Education about the programs is essential to success, and the education should probably be annual or more frequent, with requirements for a "move in" packet.

- **Reporting**: Ordinances should specify that all haulers must provide estimates of residential recycling and residential trash tonnage on a quarterly basis to the community.

The recommendations on grants and funding options are summarized above and are not detailed further here.

4.6 Impacts / Performance

The table below provides a computation regarding how a 25% goal might be achieved in the State of Colorado through two-level goals.

Table 4.2 Estimated Impacts of Legislation

Group	Population	Diversion Goal
Population density equal to or more than 240 per square mile	Adams, Arapahoe, Boulder, Denver, El Paso, Jefferson totaling 2.8 million of 4.3 million in state (2000 pop); 65% of population	33%
Population density less than 240 per square mile	35% of population	13%
State Performance	4.81 million	26% statewide

If local initiatives are the mechanism introduced in Colorado (with encouragement), a 25% goal can also be achieved. The following communities have already introduced requirements for access to recycling embedded in the trash rates (and in many cases, PAYT is also required). The diversion levels achieved in communities with these ordinances are listed below:

- Boulder: 42% - 52% diversion (includes drop-off yard waste program)
- Loveland: 52% diversion (includes yardwaste)
- Fort Collins: 27% diversion
- Superior: 21-24% diversion
- Aspen: 14% diversion (early in program)

Given this performance, it is clear that adoption of similar ordinances in communities around the State can achieve a near-term 25% diversion goal.

[100] Skumatz, Lisa A., Ph.D., 1996. "Nationwide Diversion Rate Study - Quantitative Effects of Program Choices on Recycling and Green Waste Diversion: Beyond Case Studies", Skumatz Economic Research Associates, (SERA), Superior, CO; Skumatz, Lisa A., Ph.D. 1999. "Achieving 50% in California: Analysis of Recycling, Diversion, and Cost-Effectiveness", prepared for California Chapters of SWANA, Skumatz Economic Research Associates, Inc. (SERA), Superior, CO.

[101] Research by the author (Skumatz, Pay As You Throw (PAYT) In The US:2006 Update And Analyses", Skumatz Economic Research Associates, Inc. Superior, CO December 2006) indicates that this level achieves similar diversion to rates that "double" for double the service (called "a can is a can'), but also recognizes that the largest cost for providing recycling service is getting the truck to the door, regardless of how much material is collected.

We recommend annual monitoring of progress, and of course, a higher goal should be introduced at a later date.

4.7 Economic Development and Other Impacts of Diversion for Colorado

Introduction of significant new recycling and diversion in Colorado will have impacts beyond reduced landfilling and higher diversion percentages. Landfilling is less labor-intensive than recycling, so a move toward diversion should also provide an economic stimulus to the state. The degree of this effect partly depends on the number of recycling industries within the state. We used input-output methods to estimate these impacts. These models use information on the employment and associated productivity values for all business sectors in the state. The impacts of a specific policy change are the results of the model "after" running the policy change's effects on specific industry sectors, and comparing the results with the results "before the change".

The Colorado employment in industries relevant to recycling follows in Table 4.3.[102] Colorado's estimated employment in these sectors (prior to projections of new recycling) follows:[103]

- Iron/ steel: 1,100 employees
- Aluminum sheet: 158 employees
- Plastics: 103 employees
- Glass container: 717 employees
- Composting: 136 employees

We used information on traditional curbside recycling mix[104] and recycling-related and landfilling industries in the State of Colorado to conduct the analysis. The calculations[105] used the following steps[106]:

- "Base" run of Colorado's economic situation, assuming all tons are landfilled;
- Scenario run assuming a 25% recycling rate, and reducing the tons disposed by the differential and computing the resulting economic "output" and jobs in the State;
- Scenario run assuming a 6% composting rate, and reducing the tons disposed by the differential, and computing the resulting economic "output" and jobs in the State;
- After "normalizing" to total 25% diversion, the net increase / decrease in economic output and jobs was computed to provide an estimate of the economic impacts that could derive from increased diversion in the State of Colorado.

Table 4.3 provides the simplest summary of the economic output and job impacts from the near term scenario we envision will result from the recommended recycling and diversion strategies – that is, from either:

- Imposing 25% diversion goals at the state level; or
- Encouraging adoption of local ordinances that lead to 25% diversion.

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[102] The estimated results comparing "impact" to "base / current" economic output and jobs are presented in Tables 5.4-5.6. The "impact" case considers increases in either recycling or composting beyond the current situation in the state (recycling increasing to 25%, and composting increasing to 6%); base/current assumes those tons continue to be landfilled.

[103] 2006 Census / Input-output model data.

[104] In this report, we focus on residential programs; this is traditionally the first stage of movements in recycling. This is the proxy used for these calculations. Data on the curbside mix was derived from data provided by Jeff Callahan (Boulder County) and Jerry Martin (EcoCycle)

[105] Thanks to Sherry Rudnak of Bay Area Economics for assisting us with this work.

[106] Tables outlining the industries and the steps are provided in the Appendix, Chapter 5.

Note the significant increase in jobs in recycling (and a decrease from diversion into composting).[107] These figures are net of any potential reductions in jobs in landfilling.

Table 4.3 Combined Economic Effects from Recommended Strategies
(adjusted to reflect 25% goal, rather than 31% combined effects from above scenarios)

Increment beyond BASE Landfilling	Direct	Indirect	Induced	Total
Recycling output incremental impact	$ 139.5	$ 40.2	$ 42.7	$ 222.4
Recy Jobs incremental impact	552	299	349	1200
YW output incremental impact	$ 1.9	$ (0.4)	$ (2.3)	$ (0.8)
YW Jobs incremental impact	-17	1	-19	-35
80% combined impact – output – 25% goal	*$ 113.1*	*$ 31.8*	*$ 32.3*	*$ 177.3*
80% combined impact – jobs – 25% goal	*428*	*240*	*264*	*932*

Figures in Millions for Output, jobs presented in total

Using these tonnage reduction figures and EPA modeling tools,[108] we can generate a crude order-lf magnitude estimate of the greenhouse gas reductions available from the adoption of 25% diversion in Colorado. Computations associated with the reduction of 1.2 million tons recycled rather than landfilled implies a reduction of 336,000 tons per year of carbon dioxide equivalents. Valued at about $4/ton, this is associated with a value of about $1.3 million annually.

4.8 Summary of Recommendations

Based on the review of the status, drivers, barriers, and gaps in recycling for Colorado compared to three other states, we derived find that Colorado's diversion performance lags because it lacks the following types of programs, which are present in only a fraction of the penetration in the comparison states:

- Curbside recycling
- Drop-off recycling
- Curbside yard waste
- Drop-off yard waste
- Broaden PAYT penetration
- Ensure basic, large value commercial recycling
- Educate on diversion / recycling
- Potentially a bottle bill.

Interviews with other states made it clear that natural economic/market forces did not lead the communities to implement these programs. Instead, the key drivers leading to program development were (almost uniformly):

- Legislation, with goals and measurement, and
- Funding.

[107] More detailed discussion of the results by sector is included in the appendix.

[108] Here, we use EPA's WARM model (Waste Reduction Model), using interim computations provided in another publication (Skumatz, Lisa A., and David Freeman, "Pay As You Throw (PAYT) in the US: 2006 Update and Analysis", prepared for EPA and Skumatz Economic Research Associates, Inc., Superior, CO, December 2006). The WARM model coefficients are under dispute and EPA expects to provide an updated tool soon, supporting better estimates of these effects. For valuations, we use a conservative value of $4/metric ton of CO2 from the Chicago Climate Exchange.

These were the drivers that led to the adoption of convenient curbside and other programs that lead to diversion. Other contributing drivers included: bottle bill legislation; Subtitle D landfill legislation; and green attitudes.

Although a few states had a few natural advantages that distinguish them somewhat from Colorado (local markets and ports in Oregon and California), all face similar economics in terms of tipping fees similar to Colorado's, and each has significant rural components and private hauler situations. Each state ultimately relied on legislation to drive programs.

The analysis leads us to two overarching recommendations to help "drive" recycling in the State of Colorado:

- *Introduce state-level legislation with key requirements related to goals, best practices, measurement, enforcement, education, and funding, OR*
- *Help cause local jurisdictions (communities and counties) to adopt local ordinances that require: access to (curbside) recycling; recycling fees embedded in trash rates; PAYT rate structure (preferred); education; and hauler reporting to allow measurement of progress.*
- *A grant program designed to foster sustainable recycling and diversion and overcome recycling barriers in Colorado;*
- *Identify and "lock in" a long term local or state funding source that supports these objectives.*

Details regarding the recommended legislation and strategies are summarized in the shaded boxes below.

Summary / Elements of Strategies for State-Level Legislation Recommended for Colorado

(Combining elements of Oregon, Iowa, and Wyoming legislation)

Organization and Goals

- Responsible entity: Cities and counties (for unincorporated areas and any cities not wanting to set their own plan). Encourage responsible parties to join together and develop regional plans.
- Goal: Lower goals for counties with population density lower than 95 persons per square mile, and higher for areas with greater densities. Suggestions:[109] 13% / 33% for the first threshold, increasing to 20% / 40% after 5 years.[110]
- Requirements:
  - Must do comprehensive solid waste management plan (15 year horizon) and 5 year updates
  - Law lists at least 7 potential strategies: 1) establishment of recycling drop-offs at least 1 per X000 residents collecting at least news, cardboard, HDPE, PET, aluminum cans, glass, steel cans; 2) curbside recycling at least fortnightly on same day as trash with container at least 64 gallons, no separate fee, collecting at least news, glass, HDPE, PET, aluminum and steel. 3) education program; 4) collection of at least 4 materials for Multifamily; 5) effective yard waste program including promotion; 6) commercial recycling including at least cardboard, office paper; 7) PAYT or area-wide PAYT ordinance with smallest container no larger than 32 gallons (maybe 21?), requiring 75% rate increments, and hauler reporting.
  - Small communities (<4,000) or communities in areas with county densities less than 240 persons per square mile must implement the drop-off option plus at least one additional program; or must meet the goal through programs of their own design.
  - Larger communities or communities in areas with county densities more than 240 persons per square mile must implement the drop-off and curbside programs and two others or must meet the goal through programs of their own design.

Funding for Planning and Programs: Multiple funding sources are recommended to diversify, collected at state level.

- Fee on first ownership of toxic materials in the state (per Washington State)
- Increase in landfill tip fee

[109] Goal may also be set in pounds per capita.

[110] Note we do not establish a statewide or county wide goal of zero waste. Nothing in this legislation would preclude communities from adopting or implementing such programs, and perhaps grants could be encouraged for to assist with these strategies.

Dispense the funds to the cities and counties / responsible entities as follows:

- For comprehensive plans – 33% of cost if 1 entity plans alone; 50% if plan with 2 agencies; 75% if plan with 3 agencies.[111]
- Grant program with simple application process specifically to set up rural cooperatives and drop-off truck routing systems
- Separate Grant program with more detailed application process, funding program capital for approved programs or for new programs or for needed infrastructure. In addition, provide focus grants for program or technologies or infrastructure associated with a waste stream or other need identified through state or other research.

Monitoring and Enforcement

- Communities and/or counties are responsible for gathering and reporting the following data to the State on an annual basis:
    f) Tonnage to landfill in base year (2007?)
    g) Tonnage to landfill in new year
    h) Tonnage diverted from programs 1, 2, 4, 5, (6), above separately, plus any other programs implemented in combination
    i) Tonnage per capita disposed and diverted
    j) Landfill diversion percentage and tons per capita diverted from base year.
- State gathers and posts the data on-line using Re-Trac™[112] . If the sum of the elements of c meets the goal, the community meets goal, community is in compliance. State should periodically audit tonnage reports.
- If community is not in compliance, it must:
    - Implement PAYT or if that is in place, implement one more program from the list
    - Conduct a review of the programs in place in concert with the State staff, and identify any issues with program performance and propose remedies.

Education

- State should fund statewide education at a funding level of approximately $1.00 per household per year. The state may elect to conduct the education program, or allow communities to request the funds for their community outreach up to the maximum of $1 per household per year. Leftover funds should be allocated to the grant program.
- State should sponsor workshops and establish a website geared toward helping communities with sample ordinances, contracts, PAYT materials, peer match to state and other communities with programs of interest and other materials.

Elements of Recommended Local Level Ordinances to Move Diversion Forward in Colorado[113]

- Define threshold recycling service: Each household receives 64 gallon or larger container, collected fortnightly or more frequently, and at least 5-7 key materials must be collected: mixed paper, newspaper, cardboard, steel cans, aluminum cans, and potentially glass and #1 and #2 plastics.
- Recycling embedded in trash fee: Cost of recycling program should be embedded in the trash fee – no separate or extra charge for recycling.
- Pay As You Throw (PAYT) rates: PAYT rates – incentives that charge higher fees for collection of larger volumes of trash from the household – should be specified, and the rates should be structured to present households with a combined total bill that is at least 80% higher for double the trash service (2 cans vs. 1 can, etc.).
- Education: Education, on at least an annual basis, should be required, along with a "move in" packet.
- Reporting: Ordinances should specify that all haulers must provide estimates of residential recycling and residential trash tonnage on a quarterly basis to the community.

[111] Possibly insert reimbursement maximum amount.

[112] See Appendix. Re-Trac is an affordable "off the shelf" software solid waste database management package that provides easy reports, and would cost the state about $15-$20K.

[113] Examples of these types of ordinances are available from Fort Collins, Boulder, Boulder County, Aspen, Loveland, Superior, and others. Several of these ordinances are posted on SERA's website "www.paytwest.org", a project funded by EPA Region 8 that is designed to encourage adoption of PAYT in communities in Colorado by offering free consulting and free workshops on PAYT.

In order to "encourage" adoption of ordinances of this nature, the State may consider:

- Widely publicizing ordinances and impacts,
- Offering workshops and/or technical assistance and websites on strategies,
- Providing preferences for grants (HB1288 or other grants) in communities that have passed ordinances, or other strategies.

Based on our calculations, these strategies should move the State to 26% diversion in the short run, and 33% in the longer run. If implemented, we estimate that the program will also lead to the following economic development impact in the State.

This set of recommendations should provide the following economic development impacts, which are on the order of a 35% increase in economic activity in these sectors.

Table 4.4 Combined Economic Effects from Recommended Strategies

Increment beyond BASE Landfilling	Direct	Indirect	Induced	Total
80% combined impact – output – 25% goal	*$ 113.1*	*$ 31.8*	*$ 32.3*	*$ 177.3*
80% combined impact – jobs – 25% goal	*428*	*240*	*264*	*932*

Figures in Millions for Output, jobs presented in total

5.0 APPENDICES

This appendix includes two main sections.

- Section 5.1 includes a detailed analysis of the modeling results assessing the economic development effects of additional recycling or composting in the State of Colorado; and
- Section 5.2 includes an analysis of measurement alternatives.

5.1 Detailed Analysis of Potential Economic Development Effects in Colorado

Table 5.1 Recycling and Diversion Sectors Used in Input/Output Modeling Work

Material/Economic Activity	Six-Digit NAICS	NAICS Sector
Aluminum	331315	Aluminum sheet, plate, and foil manufacturing
Glass	327213	Glass container manufacturing
Steel	331111	Iron and steel mills
Paper	322110	Pulp mills
Plastics	325991	Custom compounding of purchased resins
Compost	325314	Fertilizer (mixing only) manufacturing
Materials recovery facilities (MRF)	562920	Materials recovery facilities
Land Fills	562212	Solid waste landfill

Note:
(a) Since there are no pulp mills in Colorado, the value of the paper is input into the wholesale trade sector of recycled goods to reflect the local impacts of selling
the materials to out-of-state mills.

Sources: Skumatz Economic Research Associates, Inc. (SERA); US Census; BAE, 2008.

Table 5.2. Value of Waste Diverted from Landfill into Recycling

Material	Percent of Total Recycling	Tons	Value per Ton (a)		Total Value
Existing Recycling Conditions, 10 Percent Recycling Rate					
Total Waste Disposed		8,321,300	$30		$249,639,000
Total Waste Composted		177,970	$35		$6,228,950
Total Waste Recycled		860,990			$107,026,897
Aluminum	*1%*	*9,172*	*$1,655*		*$15,178,938*
Glass	*21%*	*181,680*	*$18*	*(b)*	*$3,187,589*
Steel	*4%*	*30,692*	*$121*		*$3,713,706*
Paper	*70%*	*601,054*	*$113*	*(c)*	*$68,019,614*
Plastics	*4%*	*38,392*	*$441*	*(d)*	*$16,927,050*
SUBTOTAL: Existing Conditions		9,360,260			$362,894,847
New Policy, 25 Percent Recycling Rate					
Total Waste Disposed		6,842,225	$30		$205,266,750
Total Waste Composted		177,970	$35		$6,228,950

Material	Percent of Total Recycling	Tons	Value per Ton (a)		Total Value
Total Waste Recycled		2,340,065			$290,885,951
Aluminum	*1%*	*24,927*	*$1,655*		*$41,254,489*
Glass	*21%*	*493,785*	*$18*	*(b)*	*$8,663,475*
Steel	*4%*	*83,417*	*$121*		*$10,093,397*
Paper	*70%*	*1,633,592*	*$113*	*(c)*	*$184,868,950*
Plastics	*4%*	*104,344*	*$441*	*(d)*	*$46,005,640*
SUBTOTAL: New Policy		9,360,260			$502,381,651
TOTAL: Incremental Change, New Policy		**0**			**$139,486,804**

Notes:

(a) Based on value of residential recycling, November, 2007.

(b) Based on the weighted average value per ton of amber glass and mixed color glass.

(c) Based on the weighted average value per ton of milk/juice cartons, chipboard/paper, news #7, OCC #11, and phone books.

(d) Based on the weighted average value per ton of plastics #3 - #7; plastics, HDPE #2 mixed colors; plastics, HDPE #2 natural; and plastics, PETE #1 mixed colors.

(e) Currently, these tons are undiverted. They represent the incremental change in tons diverted associated with the new policy. The value of undiverted waste per ton is $30.

Sources: Skumatz Economic Research Associates, Inc. (SERA); BAE, 2008.

Table 5.3 Value of Waste Diverted from Landfill into Composting

Material	Percent of Total Recycling	Tons	Value per Ton (a)		Total Value
Existing Recycling Conditions, Two Percent Composting Rate					
Total Waste Disposed		8,321,300	$30		$249,639,000
Total Waste Composted		177,970	$35		$6,228,950
Total Waste Recycled		860,990			$107,026,897
Aluminum	*1%*	*9,172*	*$1,655*		*$15,178,938*
Glass	*21%*	*181,680*	*$18*	*(b)*	*$3,187,589*
Steel	*4%*	*30,692*	*$121*		*$3,713,706*
Paper	*70%*	*601,054*	*$113*	*(c)*	*$68,019,614*
Plastics	*4%*	*38,392*	*$441*	*(d)*	*$16,927,050*
SUBTOTAL: Existing Conditions		9,360,260			$362,894,847
New Policy, Six Percent Composting Rate					
Total Waste Disposed		7,937,654	$30		$238,129,632
Total Waste Composted		561,616	$35		$19,656,546
Total Waste Recycled		860,990			$107,026,897
Aluminum	*1%*	*9,172*	*$1,655*		*$15,178,938*
Glass	*21%*	*181,680*	*$18*	*(b)*	*$3,187,589*
Steel	*4%*	*30,692*	*$121*		*$3,713,706*
Paper	*70%*	*601,054*	*$113*	*(c)*	*$68,019,614*
Plastics	*4%*	*38,392*	*$441*	*(d)*	*$16,927,050*
SUBTOTAL: New Policy		9,360,260			$364,813,075
TOTAL: Incremental Change, New Policy		**0**			**$1,918,228**

Material	Percent of Total Recycling	Tons	Value per Ton (a)	Total Value

Notes:
(a) Based on value of residential recycling, November, 2007.
(b) Based on the weighted average value per ton of amber glass and mixed color glass.
(c) Based on the weighted average value per ton of milk/juice cartons, chipboard/paper, news #7, OCC #11, and phone books.
(d) Based on the weighted average value per ton of plastics #3 - #7; plastics, HDPE #2 mixed colors; plastics, HDPE #2 natural; and plastics, PETE #1 mixed colors.
(e) Currently, these tons are undiverted. They represent the incremental change in tons diverted Associated with the new policy. The value of undiverted waste per ton is $30.

Sources: SERA, Inc; BAE, 2008.

Table 5.4 Existing and Future Waste Diversion Rates and Tons

Existing Conditions	2008
Statewide Population	4,810,000
Tons of Waste Disposed, Per Capita	1.73
Tons of Waste Recycled, Per Capita	0.179
Tons of Waste Composted, Per Capita	0.037
Total Tons Disposed	8,321,300
Total Tons Recycled	860,990
Total Tons Composted	177,970
Conditions, after Recycling Policy	
Tons of Waste Disposed, Per Capita	1.42
Tons of Waste Recycled, Per Capita (a)	0.487
Tons of Waste Composted, Per Capita	0.037
Total Tons Disposed	6,842,225
Total Tons Recycled	2,340,065
Total Tons Composted	177,970
Incremental Tons of Waste Disposed	(1,479,075)
Incremental Tons of Waste Recycled	1,479,075
Incremental Tons of Waste Composted	0
Conditions, after Composting Policy	
Tons of Waste Disposed, Per Capita	1.65
Tons of Waste Recycled, Per Capita	0.179
Tons of Waste Composted, Per Capita (b)	0.117
Total Tons Disposed	7,937,654
Total Tons Recycled	860,990
Total Tons Composted	561,616
Incremental Tons of Waste Disposed	(383,646)
Incremental Tons of Waste Recycled	0
Incremental Tons of Waste Composted	383,646

Notes:
(a) Assumes policy results in a 25 percent recycling rate.
(b) Assumes policy results in a six percent composting rate.

Sources: Skumatz Economic Research

Associates, Inc. (SERA); BAE, 2008.

Results of New Policy	
Recycling Rate	25%
Composting Rate	6%

Table 5.5 Recycling Activity Impacts

Economic Impacts (a)	Direct	Indirect	Induced	Total
New Policy, 25 Percent Recycling Rate				
Output	$502,400,000	$171,200,000	$174,500,000	$848,100,000
Employment	1,949	976	1,427	4,352
Less: Baseline Case				
Output	$362,900,000	$131,000,000	$131,800,000	$625,700,000
Employment	1,397	677	1,078	3,152
Net Policy Impact				
Output	$139,500,000	$40,200,000	$42,700,000	$222,400,000
Employment	552	299	349	1,200

Note:
(a) Reported in 2007 dollars.

Sources: BAE, 2008.

Table 5.6 Composting Activity Impacts

Economic Impacts (a)	Direct	Indirect	Induced	Total
New Policy, 25 Percent Recycling Rate				
Output	$364,800,000	$130,600,000	$129,500,000	$624,900,000
Employment	1,380	678	1,059	3,117
Less: Baseline Case				
Output	$362,900,000	$131,000,000	$131,800,000	$625,700,000
Employment	1,397	677	1,078	3,152
Net Policy Impact				
Output	$1,900,000	($400,000)	($2,300,000)	($800,000)
Employment	(17)	1	(19)	(35)

Note:
(a) Reported in 2007 dollars.

Sources: BAE, 2008.

Summary of Economic Development Conclusions

Increase in Recycling Rate

- Largest *direct output* impacts in the waste management and remediation, and wholesale trade sectors. The wholesale trade impact results from recyclers selling paper to out-of-state mills.

- Largest *direct employment* impacts in the wholesale trade, waste management and remediation, and the custom compounding of purchased resins (plastics recycling) sectors.

- Largest *indirect (business to business) output* impacts in the wholesale trade, waste management and remediation, oil and gas extraction, and petroleum refineries sectors.

- Largest *indirect employment* impacts in the wholesale trade, waste management and remediation, employment services, and truck transportation sectors.

- Largest *induced (labor's household expenditures) output* impacts in the owner-occupied dwellings (payments to housing), wholesale trade, offices of physician's and dentists (payments to health), and food services and drinking places sectors. These are always the largest induced impacts, because this is how all households spend their incomes.

- Largest *induced employment* impacts in the food services and drinking places, offices of physician's and dentists, and hospital sectors.

Increase in Composting Rate

- Largest *direct output* impacts in the waste management and remediation, and wholesale trade sectors, fertilizer (mixed only) manufacturing, and the custom compounding of purchased resins (plastics recycling) sectors.

- Largest *direct employment* impacts in the waste management and remediation, and wholesale trade sectors, fertilizer (mixed only) manufacturing, and the custom compounding of purchased resins (plastics recycling) sectors.

- Largest *indirect output* impacts in the wholesale trade, waste management and remediation, oil and gas extraction, and petroleum refineries sectors.

- Largest *indirect employment* impacts in the wholesale trade, waste management and remediation, commercial machinery repair and maintenance, and truck transportation sectors.

- Largest *induced output* impacts in the owner-occupied dwellings (payments to housing), wholesale trade, offices of physician's and dentists (payments to health), and food services and drinking places sectors. These are always the largest induced impacts, because this is how all households spend their incomes.

- Largest *induced employment* impacts in the food services and drinking places, offices of physician's and dentists, and hospital sectors

5.2 Measurement Appendix

Progress Tracking: Measurement Options and Recommendations

Most communities and states around the country use one of two main methods for measuring progress in diversion:

- Landfill diversion – measuring the tonnage disposed at any and all landfills receiving waste generated in the city against a "base" year. Variations on this approach are used in California and other states, as well as many communities and joint authorities.

- Program diversion / recovery basis – measuring the tonnage diverted by each program, expressed as a percent compared to the year's generation or total diverted and disposed tons. This approach has been addressed by EPA and is a standard in many communities.

The basic advantages of each approach are shown in Table 5.7 below. The advantages of one are generally the opposite of the disadvantages of the other, so redundancy is avoided.

Table 5.7. Summary of Advantages of Traditional Measurement Methods[114]

Pros for Landfill Diversion Tracking Approach	Pros for Program Diversion Tracking Approach
• Limited number of sources for data (sometimes few and straightforward; sometimes hard to separate data for communities if routes cross community lines) • One overall measure – no "double counting" of tons • Facilitates comparison with other communities using similar definitions • Accounts for source reduction/ waste prevention, not just "diversion" programs	• Provides method to attribute tons to specific programs and initiatives • Data from clear sources, although requires data from many sources • Traditional measurement approach

One other tracking method that has been used in many communities is a per-capita approach.

- Per Capita and other "Normalized" methods – Tons are divided by the population or employment in the jurisdiction. This is usually applied to disposal totals and sometimes program totals, with the hope that the tons per capita disposed would decrease (or increase more slowly) than they might otherwise without programs, and that recycling per capita would increase. The approach has the advantage of "normalizing" data in a simple / clear manner, facilitating comparisons.

Measurement Recommendations

SERA has worked with many communities to develop or improve measurement of diversion. We generally suggest that one method is not enough to meet all the tracking needs of the community. We usually recommend two basics, with individualized variations:

- Per-capita landfill diversion, with the suggestion that both per-capita (or per household) and per-employee figures are calculated. Examining / tracking both can help explain and provide comparisons for the typical community (with the residential / commercial split usually between 60:40 or 40:60) and for a less typical community.

[114] Some of this section was used and expanded in an assignment for the City of Fort Collins, 2006. We appreciate the assistance of Delyn Kies of Kies Strategies in the preparation of some of the case studies in this section.

- Program diversion approach, because it provides critical information on which programs are responsible for diverting high levels of material, or critical materials, and supports analyses of program-based effectiveness.

No one measure is perfect. Using both provides a fairly well-rounded analysis of diversion performance – either over time (within a community) or for comparisons between communities.

Complications very often arise in measuring non-residential tonnages. Disposal tonnages for large generators may be available (if facilities are public). Implementing an ordinance that requires quarterly tonnage reporting as a license requirement can also help in data collection, even though it may not be entirely accurate or complete. The information may need to be augmented by surveys with self-haulers, businesses, facilities, or others to get a more complete view of trash and/or recycling tonnage from the sector. With limited resources, proxy estimates may be generated using on-line data on generation or disposal by business sector, "multiplied up" to represent the number, size, and distribution of businesses by sector in each community.

Programs are important; however, evaluating the impacts of the program is also important and should be an important part of assessing whether the program is an appropriate expenditure of public funds. Evaluation does not have to be difficult (or expensive), but it is much easier (and less costly) if it is planned for and embedded into the program's initial plan. Evaluations are important in providing information to measure progress toward goals, justify budgets, examine program tradeoffs and optimize program portfolios, identify when programs are no longer needed, refine programs, and myriad other uses.

Based on almost three decades of evaluation experience in energy and solid waste, extensive interviews with solid waste agencies, and review of the literature, we have summarized methods of assessing and measuring impacts from diversion programs, and provide recommendations on a menu of useful and practical indicators and approaches. Although the recommendations may seem overwhelming, in fact, they are designed to streamline a community's efforts in planning and evaluation to focus on those with greatest value and efficiency.

Data Repository Options – Re-Trac ™

The cost of the system for Oregon is prohibitive. More and more states are finding it cost-effective to move to a "commodity" tracking product – Re-trac. Re-Trac is a subscription based service, with length of service contracts ranging from 1-5 years. Actual cost is a fixed subscription fee based on the population of the jurisdiction the software will be used for. Subscriptions of longer than a year will have the same rate, regardless of how population expands over those years.

http://www.re-trac.com/cost.html

It is currently used by:
- South Carolina,
- Tennessee,
- Georgia
- Rhode Island,
- Nebraska,
- Wisconsin, and shortly, Pennsylvania.

The data base houses and organizes data from communities at the state level, and produces standard reports that meet a variety of planning and reporting needs. For the State of Colorado, an estimate of the base package would cost approximately $15,000-$20,000. There are fields available for tracking material streams (recycling, compost, trash, HHW), recyclable, materials, and sectors residential, commercial, industrial, institutional). Reporting is easy and fairly comprehensive, and add-ons can also be purchased to increase its flexibility.

A testimonial from the Re-TRAC website follows.

"Re-TRAC is already paying dividends here in our community and I only see our use of the program expanding. Far and away, the most impressive attribute of the system is that it allows us to do, in seconds, the type of analysis that used to take us hours if not days. More and more in the recycling field, it is not good enough to simply have a program. You have to be able to analyze the results of that program, look for efficiencies, best practices, etc, and have that information available for policy makers at a moments notice. Re-TRAC allows us to do just that. We are also preparing to utilize Re-TRAC in a manner which will provide much more information to the managers of individual community recycling programs while improving the visibility of individual program results. As we transition our data collection methods, it will also allow us to reduce hours of tedious paper work by allowing program managers to directly enter their program results into the system. We have even been able to greatly expand the quality of data we provide in our annual reports to OEPA with almost zero additional effort.

I simply can't say enough about the promise we see for this system. We're truly excited about continuing our work with you and the rest of your team at Emerge."

Holly Christmann, Manager
Hamilton County Solid Waste Management District

http://www.re-trac.com/testimonials.html