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## ***COLORADO'S WASTED VALUE:***

### ***Recyclables Discarded in the Front Range and Rest of the State and their Dollar, Job, and GHG Impacts***

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## Key Findings and Implications

Recyclables are discarded with the trash every day, and in Colorado's case, that represents about 1.1 million tons of materials per year that are currently recyclable and with substantial market value.<sup>1</sup> The authors used information from waste characterization studies around the state, and recent market prices to analyze the value of materials discarded across Colorado.<sup>2</sup> **State-wide**, we found:

- About 27% of the materials currently being disposed are recyclables with current markets and value.<sup>3</sup>
- Materials with between \$145-170 million per year in market revenues are currently disposed; the net revenues (after processing costs), are about half that value.
- The potential to create more than 1,000 jobs from transferring tons from labor-unintensive landfilling to more-labor-intensive recycling.
- Reduction in greenhouse gas emissions (GHG) measured in Metric Tons of Carbon Equivalent (MTCE) of between 1.2 million (without landfill gas recovery) and 0.8 million with gas recovery.<sup>4</sup>

**Front Range vs. Rest of State:** We found significant remaining value in the waste streams in the I25 corridor and Front Range, which represents about half the state's population, and contains some of the

## KEY RESULTS

- Colorado throws away 1.1 million tons and \$145-170 million worth of recyclables every year
- Front Range programs recover more material than the rest of the state but miss \$50 million of recyclable revenues annually.
- Recovering these recyclables could help create more than 1,000 jobs and 1.2 MTCE in avoided GHG emissions.
- The highest value materials disposed are: aluminum, cardboard, and certain plastics.
- Improving recovery of existing materials brings more revenue than adding "new" materials.
- Policies to improve the situation include:
  - Cardboard ban
  - PAYT & embedded recycling costs
  - Supporting outreach
  - Targeted commercial policies, incentives, and bans
  - State leadership, including goals, tracking, landfill surcharges, tax policy, and other incentives, and targeted grants.

<sup>1</sup> This omits another 0.1 million tons that represent amounts of ferrous and non-ferrous scrap with substantial value per ton. These scrap tons were more commonly from the commercial sector. Given the high value, and the commodities' long-established recovery infrastructure, we conservatively assume these remaining materials have difficulties or barriers to recovery.

<sup>2</sup> Note this study intentionally only addresses recycling; organics represent another substantial unrecovered waste stream in Colorado. The authors have published extensively on organics and on integrated recycling and organics policy elsewhere.

<sup>3</sup> Based on regional market prices for the period 2013-2015 (through April for 2015).

<sup>4</sup> Based on factors from EPA's WaRM Model

most mature recycling programs in the State of Colorado. In the **Front Range**, we found:

- About 21% of the waste stream consists of recyclables with current market value. The current recovery rates are higher than the rest of the state, as expected, but not insignificant. Valuable recovery potential remains.
- \$50 million in market value is landfilled annually; again, the net value after processing is about half this value. Three examples of annual missed revenues include \$7 million from Boulder County, \$4 million from Larimer County, and \$13 million from Denver.
- About 300 jobs could be created by recycling these Front Range tons rather than landfilling the material.
- GHG emissions avoided annually are more than 350,000 MTCE (without landfill recovery).

The recoverable value from the remainder of the State is higher than the value available from the Front Range; about 70% of the value of materials statewide are landfilled outside the Front Range. However, programs, infrastructure, incentives, and networks are generally less mature outside the I25/Front Range corridor, and we found the commercial landfilled waste stream may contain almost 40% materials with current market value. Residential recovery also lags behind rates in the Front Range.

**Commercial vs. Residential:** Residential programs have had an effect. Recovery from the residential sector was higher than the commercial sector (there were 6-7 percentage points less recoverable materials from the residential sector), and statewide, more than half the remaining landfilled materials with immediate value are disposed by the commercial sector. Both high grade office paper and cardboard are disposed by the commercial sector in greater volumes; for each sub-region we examined, the percent of the recoverable waste stream represented by cardboard was nearly twice as high in the commercial sector.<sup>5</sup> Disposed cardboard alone represents more than \$30 million annually in value thrown into landfills.

**Highest Value Commodities:** We examined the materials with greatest value currently being landfilled. Under current market conditions, the materials with greatest unrecovered value include three of near-equal value – each between \$30-\$40 million per year:

- Cardboard,
- Aluminum cans (not all of which are currently recovered), and
- Specific plastics, particularly rigid and HDPE, combined here.

Other materials of substantial value are also highlighted in Figure 1 below. Glass not currently recovered represents about \$1-2 million per year, assuming a substantial share is separated by color. Normally, the calculations would indicate glass is not a high priority, because glass prices are relatively low and the heavy material is relatively expensive to deliver to market. However, there are two new companies in the Front Range with the ability to process glass, and are

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<sup>5</sup> This ratio was somewhat lower in the Front Range.

expected to have mature markets later this year. Thus, locally (which is the most relevant market for this material), glass should have higher value and create more jobs and economic throughput by the end of this year.

**Figure 1: Classes of materials of greatest recoverable value for the State of Colorado**

Group	Potential Market Value/year	Materials
Highest value	\$30-\$40 million per year, each, statewide	Cardboard, aluminum cans, Rigid & HDPE
2nd Highest value	\$7-\$15 million per year, each, statewide	PET, High grade office, ONP, Mixed paper

**“Next” Commodities:** We examined a number of materials that are disposed, and that are not commonly recycled in Colorado. One with large revenue potential – if it can be recovered from the stream effectively – is plastic film. This may represent a stream worth in the tens of millions of dollars statewide. Recovery of neither aseptic containers nor shredded paper seem to represent a large missed revenue stream. The study indicates that achieving greater recovery of currently-accepted materials with strong existing markets represents the greatest value-recovery potential.

**Figure 2: Summary Results: Amounts and Value of Recyclable Materials Currently Landfilled in the State of Colorado**

State Region	Population, million	Recyclable Tons per year (TPY) with Current Value, millions	Current Market Value of Recoverable Tons (\$million/yr)	Market value, 3 year range of revenues (\$million/yr)	Job Creation Potential <sup>6</sup> , (Net)	GHG in MTCE (without LFG recovery / with recovery) (millions)
Colorado State-wide	5.3 million	1.1-1.2 million TPY	\$145-170 million	\$145-190 million	~1,000	1.3 million MTCE / 0.8 million MTCE
I25/Front Range	2.6 million	0.3 million TPY	\$45-50 million	\$45-55 million	~300	0.4 million MTCE / 0.2 million MTCE
Rest of State	2.6 million	0.8 million TPY	\$100-120 million	\$100-135 million	~700-800	0.9 million MTCE / 0.6 million MTCE

<sup>6</sup> Using simple job creation statistics from Institute for Local Self Reliance of 9 net new jobs transferring 10,000 tons from landfilling to recycling.

## Policy Implications and Recommendations

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Based on our findings, the authors identify several key recommendations deriving from this study.

1. **Cardboard Disposal Ban:** The State – or local communities – should consider following Fort Collins’ lead, and instituting a cardboard disposal ban. This would recover substantial value from landfills (and create jobs) for a material with some of the strongest longstanding markets of any recyclable material. A ban is recommended as one of the few methods to significantly stimulate recycling of this material from the commercial sector.
  
2. **Better Recovery of Existing Recyclables - Residential:** Materials that are already recyclable through the State’s existing (mostly) single stream facilities represent the bulk of value in Colorado’s landfill disposal stream. On the residential side, two key policies to achieve this include:
  - **Residential incentives:** The most effective options are PAYT and recycling costs embedded in the trash rate.
    - 1) Embed the cost of recycling in residential trash rates, preferably through state laws or local ordinances. This provides a very strong diversion incentive.
    - 2) Introduce PAYT trash rate incentives where they do not currently exist. This can be introduced through state law<sup>7</sup>, local ordinance<sup>8</sup>, or by contracting / districting of haulers.<sup>9</sup> PAYT is extremely effective and cost-effective.
    - 3) Enhanced PAYT: Communities that have already adopted PAYT can achieve higher recycling levels if they assure the total rates are structured to charge about 80% more for 64 gallons vs. 32 gallons<sup>10</sup>, and to have small container options (no greater than 32 gallons).

### IMPACTS OF POLICIES

*If these strategies resulted in half the remaining residential materials in the Front Range being recovered, this would represent \$15 million in additional revenues, and add up to 6-8 percentage points to the community’s residential recycling rate. Collection costs would be minimal (collection already exists), and net revenues after processing costs would likely be about \$8 million.*

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<sup>7</sup> As in Minnesota, Washington, and Oregon, and especially, new and very strong legislation in Vermont (see Skumatz, et.al. “PAYT: 2014 Update”, Econservation Institute, prepared for EPA Region 9, March 2015.

<sup>8</sup> As in Boulder County, Vail, Boulder, and other communities in Colorado.

<sup>9</sup> As in Lafayette, Louisville, Edgewater, Sheridan, and other communities.

<sup>10</sup> Cited in Skumatz, et.al. “PAYT: 2014 Update”, Econservation Institute, prepared for EPA Region 9, March 2015 and earlier publications.

- **Education:** An education campaign focused on recycling more of eligible materials would be useful, but education alone, even the best education, cannot be expected to achieve the desired progress on its own, and may have a relatively short lifetime. However, education can be an important component in association with these other policies.
  - **Spread Strong Recycling Statewide:** Improve residential recycling opportunities in the large communities outside the Front Range, focusing on those near suitable infrastructure. Policies (PAYT, embedded recycling, ordinances, etc. as mentioned above) will increase recycling significantly. Grant programs may help address issues concerning financing of recycling containers. Drop-off programs can be very effective when they are in place with PAYT incentives.<sup>11</sup> Workshops and tools may help communities identify steps forward.
3. **Better Recovery of Existing Recyclables – Commercial:** The commercial sector in Colorado has had only limited incentive to recycle. Major barriers include low landfill tipping fees (between about \$10 and \$15 per ton), the extra cost posed by an additional collection to gather recyclables, limited intervention by communities into the commercial stream (Colorado cities have focused on the residential sector) and in some cases, inertia by businesses in “right-sizing” and seeking out revised bids for integrated trash and recycling (and organics) service. Useful policies from other locations include the following.
- **Commercial PAYT and other Incentives:** The single strongest incentive for commercial recycling is commercial PAYT. Vail recently implemented this policy, which requires recycling costs to be embedded in the (hauler) trash bills and makes recycling plus trash no more expensive than trash service only.<sup>12</sup> This can be implemented at the local (city or county) level.<sup>13</sup> In some states, financial incentives are provided to haulers to meet recycling tonnage goals in the commercial (and/or residential) sector.<sup>14</sup>
  - **Mandates and Bans:** Many states and counties have implemented bans (cardboard is recommended above). Some ban all traditional recyclables from disposal; others target specific materials or target some business sectors that generate large quantities of specific materials.<sup>15</sup> These policies have been effective at establishing

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<sup>11</sup> Skumatz, Lisa A., ““Beyond Case Studies: Quantitative effects of recycling and variable rates programs”, *Resource Recycling*, September 1996, and numerous publications following.

<sup>12</sup> This policy also exists in other communities around the nation (Seattle, elsewhere); see Skumatz, 2014, “A Roadmap for Implementing Effective Commercial Waste Reduction Strategies”, Prepared for City of Denver and USDN.

<sup>13</sup> Other useful incentives relate to landfill surcharges, are discussed in the State Leadership section.

<sup>14</sup> In some cases, these are extensions to existing contracts, franchise fee discounts, or other designs. It would take a bit of work to adapt some of these to the Colorado environment.

<sup>15</sup> Examples include: requiring recycling of cans and bottles by bars and restaurant, phasing in recycling from largest generators first, and other policies. See Skumatz, 2014, “A Roadmap for Implementing Effective Commercial Waste Reduction Strategies”, Prepared for City of Denver and USDN.

sufficient quantity to improve the economics of collection. The format may be bans, or mandatory recycling; both have similar intents and effects.

- **Outreach and Other Strategies:** It may be that some commercial businesses would see improved economics if they re-bid for privately-delivered trash and recycling (and potentially organics) service as an integrated package.<sup>16</sup> Communities and states can encourage right-sizing and provide sample contracts and invoicing for clearer recycling incentives. The other initiatives can be *supported by* outreach on recycling opportunities, implementation of business recognition programs, requiring recycling plans, and other strategies.<sup>17</sup>
4. **State Leadership:** Previous studies of the drivers for progress in leading states<sup>18</sup> found that, in addition to the strategies mentioned above, state leadership – not economics – was a key driver in recycling achievement. Achieving the revenue and job impacts would be substantially aided by the following policies.
- **Goals:** Establish a statewide recycling and diversion goal, with measurement, and with state authority at CDPHE or another agency to provide education, tracking, and funding for community / county progress. Fund these responsibilities.
  - **Tracking:** Establish a tracking method and any needed supporting tools,<sup>19</sup> which will reflect the status and progress of recycling and diversion in both the State’s residential and commercial tonnage. The state, and communities / counties, potentially with input of haulers or other agents, should implement the measurement and report periodically, preferably at least annually.
  - **Plans:** Colorado has lagged many other states, which conduct state-level recycling plans to identify waste management needs, and priority solid waste and diversion strategies going forward.<sup>20</sup> Many other states also require recycling plans of solid waste planning agencies, sometimes cities, counties, solid waste management districts, or other levels. These documents considerably help progress, and the State should recommend they cover both residential and commercial strategies. State-level agencies<sup>21</sup> need to become more involved in solid waste planning

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<sup>16</sup> See Skumatz, D’Souza, and BeMent, ““Cracking Commercial Contracts: Commercial recycling can be thwarted by codes and clauses within hauler contracts that leave businesses ignorant of diversion opportunities”. *Resource Recycling*, September 2014.

<sup>17</sup> These strategies can augment other initiatives, but are not very effective, cost-effective, or long-lasting on their own.

<sup>18</sup> Skumatz and Freeman, 2008, “Colorado Roadmap for Moving Recycling and Diversion Forward: Strategies and Implications”, Prepared for CDPHE, Skumatz Economic Research Associates, Inc., Superior, CO 80027, and Skumatz, 2014, “A Roadmap for Implementing Effective Commercial Waste Reduction Strategies”, Prepared for Denver and USDN.

<sup>19</sup> Re-Trac™ was recommended in previous Colorado work. This tracking system has been adopted by other states. Other options may also exist. Skumatz and Freeman, 2008, “Colorado Roadmap for Moving Recycling and Diversion Forward: Strategies and Implications”, Prepared for CDPHE, Skumatz Economic Research Associates, Inc., Superior, CO 80027

<sup>20</sup> The State should encourage expert assistance in the development of the project, potentially from CAFR and other waste diversion experts in the State.

<sup>21</sup> Including, presumably CDPHE

(separate from enforcement duties), and one focus should be the recovery of value from the waste stream as a job creation driver.<sup>22</sup> In addition, given the substantial benefits in GHG emissions (about 1 million MTCE, or 3.7 million metric tons of CO<sub>2</sub>e), and the cost-effectiveness of recycling, recycling strategies should be at the table in larger sustainability meetings at the State – and local / regional – levels.<sup>23</sup>

- **Funding:** Provide a funding mechanism, through a grant program or other method, for communities implementing the strategies described in this document. State funding to help meet new priorities and policies are one of the top three “success” strategies in other states.<sup>24</sup> To provide sufficient support funds, other states have allowed or authorized implementation of various types of recycling planning fees (CA) and landfill and other fees and surcharges (IA and others) in conjunction with the establishment of goals and planning responsibilities and to help fund infrastructure needs. The current RREO program is a useful tool, but higher funding levels and more diversified options are necessary to approach the investment of other states that are recovering considerably more of their states’ recycling value.
- **Incentives:** Commercial recycling can be considerably aided by providing a surcharge on landfill fees at the state level<sup>25</sup> – one of the most effective potential policies -- or by taxing landfilled tons and exempting recycled (or composted) tons.<sup>26</sup> Tax policies favoring investment in recycling infrastructure can also help increase access to recycling and increase capture of valued materials in underserved areas of the state.

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<sup>22</sup> Perhaps involving a state-level economic development-related agency to better recognize the cross-benefits.

<sup>23</sup> In previous work by the authors, the recycling strategies needed to achieve these savings (recycling and PAYT) were found to be more cost-effective and more quickly implemented than many of the energy efficiency strategies that are usually considered first in sustainability. Recycling strategies are also more easily within the power of communities and counties (and in some ways, the state) than are energy efficiency programs. One leading Colorado community found 40% of their first 5 years of progress in sustainability came from their recycling / waste management strategies, even though energy / water / transportation strategies were expected to lead. See Skumatz, “Recycling and Climate Change: Finding the “Biggest Bang” Community Strategies for Reducing GHG”, *Resource Recycling*, 10/2008; Skumatz and Freeman, “Recycling’s Role in the Sustainability / Climate Change Conversation: Finding The “Biggest Bang” Community Strategy For Reducing Greenhouse Gas Emissions”, *Proceedings of SWANA’s WasteCon Conference*, 2011; and Skumatz, “Do Energy Efficiency Strategies Outperform Recycling in GHG Mitigation and Job Creation? *Proceedings of the IEPEC Conference*, Portland, August 2009.

<sup>24</sup> Skumatz and Freeman, 2008, “Colorado Roadmap for Moving Recycling and Diversion Forward: Strategies and Implications”, Prepared for CDPHE, Skumatz Economic Research Associates, Inc., Superior, CO 80027, and Skumatz, 2014, “A Roadmap for Implementing Effective Commercial Waste Reduction Strategies”, Prepared for Denver and USDN.

<sup>25</sup> Some states have implemented surcharges at county or other levels, but Colorado has many privately-owned landfills, muting the effect of that kind of policy.

<sup>26</sup> In a 2013 analysis by the authors of some other areas where these types of economic incentives have been set at significant values, these fees have led to much higher recycling rates and triple the adoption of composting programs among businesses and schools.

## *Methodology for the Study*

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To conduct this work, the authors used three main sources:

- Waste composition studies conducted by SERA and others for the communities and counties across the State;
- Waste generation information for the State and sub-areas, based on research conducted by the authors; and
- Market price data for key recyclable commodities.

We used an existing SERA model<sup>27</sup> assemble data from almost a dozen existing waste composition studies into proxy waste compositions for the sub-regions of the state and for the State as a whole. Information on the commercial sector was more sparse than residential data, but we identified sufficient sources and information to draw conclusions.

Waste generation figures were developed from a number of sources:

- Zero Waste and Comprehensive waste plans, and tonnage forecasts prepared by SERA for communities and counties around the State, and county / city ZW plans from around the State.
- Hauler and tonnage reports, including surveys SERA conducted for RCAB and other entities, county reports, and other sources.
- Nationwide information collected and maintained by the authors.

A simplified method was used to compute the job creation potential of the recycling changes. The Institute for Local Self Reliance has published work stating 10,000 tons landfilled leads to 1 job; 10,000 tons recycled leads to 10 jobs. This translates to 9 net new jobs from recycling over landfilling 10,000 tons. This is the simplistic factor applied in this internally-funded study.

Finally, EPA's WaRM model was used to compute the Metric Tons of Carbon equivalent of avoided green-house-gas (GHG) emissions from recovering and reusing recycled materials vs. disposal and virgin material processing. To translate the results to metric tons of carbon dioxide equivalents, multiply the figures provided by 3.7.

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<sup>27</sup> SERA's "WasteCompProxy" model.