



Plastics White Paper

*Optimizing Plastics Use,
Recycling, and Disposal
in California*

May 2003



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Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, **Flex Your Power** and visit www.consumerenergycenter.org/flex/index.html.

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Executive Summary

Background Issues

Plastics production continues to far outpace plastics recycling, and it is displacing other more recyclable materials. As a result, plastics in municipal solid waste continue to grow rapidly, and plastics represent the fastest growing portion of the municipal solid waste stream.

Plastics represent approximately 8.9 percent (by weight) and an estimated 17.8 percent (by volume) of the material disposed in California landfills. This ranks plastics as the second-largest category of waste volume (behind paper) going into municipal landfills.

The plastics recycling rate has stagnated at a low level, and plastic recycling quantities and rates remain lower than other materials such as steel, aluminum, glass, and paper. Plastics “bottle-to-bottle” recycling historically has been miniscule compared to other secondary material closed-loop recycling. Closed-loop recycling means that the specific material recycled is used to manufacture the same product again.

Plastics historically have been uneconomical to recycle without subsidies (average collection and processing costs exceed scrap values by more than two-and-one-half times). Plastics are generally not as economic to recycle as other material types, and plastic recycling costs could rise further due to the proliferation of different plastic containers. Higher plastic recycling rates come at a high cost, and higher than that for other material types.

Plastics are integral to our lifestyle and economy, and they have societal benefits due to their light weight and versatile range of applications. However, significant side effects—known as economic externalities—may impact third parties other than the producers or consumers of plastics. This could be true in the plastics production, use, recycling, and disposal phases. Possible externalities could be litter, marine ecosystem impacts, chemical emissions, and known/unknown health risks.

An example would be the cost to society of pollution caused by illegal disposal of plastic food containers.

These containers are washed into the storm drain system, clogging the system and creating localized flooding. When released into the ocean, the plastic breaks into smaller pieces where they are ingested by birds and fish. The plastic is retained internally in the animal’s digestive system, which results in death by starvation.

Existing State Programs

Currently, the State has no comprehensive management policy for plastics. The California Integrated Waste Management Board (CIWMB) manages two existing specific plastic programs: regulated trash bags and non-exempt rigid plastic packaging containers. Combined, these programs address a minimal amount of the plastic materials disposed in landfills.

The Integrated Waste Management Act program of the CIWMB also encompasses plastics, among other material types. Additionally, the Beverage Container Recycling program at the Department of Conservation (DOC) targets various beverage containers—including plastic containers—sold in the state. Furthermore, Chapter 406, Statutes of 2001 (Karnette, SB 1127) requires the CIWMB to conduct a study on the use and disposal of polystyrene in the state.

Recommendations

The CIWMB, in partnership with the DOC, recognized many of the above issues and commissioned the professional services of NewPoint Group, Inc. (NPG). NPG is an independent and impartial management consulting organization with substantial experience in California plastics and recycling issues.

Plastics White Paper: Optimizing Plastics Use, Recycling, and Disposal in California defines current California plastics issues and provides a menu of policy options for the State to consider. This report (1) provides an assessment of the current state of plastics, (2) assesses current goals and programs affecting plastics, and (3) identifies long-term plastics policy options. These policy options are all intended to help optimize plastics use (including

production of plastics), recycling, and disposal in California, thereby serving to (1) conserve resources, (2) increase the plastics recycling rate, and (3) increase the use of recycled plastics.

The three plastics management programs under the jurisdiction of the CIWMB—and one DOC program that includes plastics—are flawed collectively and individually. Accordingly, plastics issues in California are not being effectively addressed. This report makes specific recommendations for modifications to the four laws governing plastics in California.

In addition to identifying numerous detailed policy options, this report recommends that the State:

- Develop management systems to optimize plastics use, recycling, and disposal that will benefit from the positive characteristics of plastics and minimize their negatives.
 - Create policy options to internalize the economic and environmental externalities associated with plastics, with the goal of equitably sharing these costs between all involved parties.
 - Promote plastics resource conservation and minimize the unnecessary use of plastics.
 - Identify reasonable recycling targets for plastics and promote technological innovations in plastics recycling where economically and technically feasible; promote plastics with reduced environmental impacts, such as biodegradable plastics; and promote technological innovations for less-recyclable plastics, such as conversion technologies.
 - Encourage bottle-to-bottle plastics recycling and other recycled-content plastic products where technologically and economically feasible.
 - Promote and support innovations in plastics product and packaging design for recycling to allow for the economical collection of clean plastic streams.
 - Allow flexibility in plastics policies and programs in order to accommodate changes in global economic conditions, as well as new developments in plastics recycling and production.
- Develop a long-term comprehensive approach to resolving plastics issues in California reflecting product stewardship/shared responsibility principles and the unique characteristics of plastics as compared to other materials.

Organization of Plastics White Paper

The plastics white paper project consists of the main report and five appendices. The main report and Appendix A may be downloaded from the Board's Plastics Web site (www.ciwmb.ca.gov/Plastic/) or Publications Catalog (www.ciwmb.ca.gov/Publications/ and select "Plastics"). Appendices B–E have not been reproduced because of their size. Please contact Board staff to review the entire report including the appendices. The report including all appendices is in the CIWMB Library collection. Catalog information on the plastics white paper and appendices may be accessed at www.ciwmb.ca.gov/Library/Books/ or by calling (916) 341-6197.

- *Plastics White Paper: Optimizing Plastics Use, Recycling, and Disposal in California*. This is the primary white paper document and includes three chapters:
 - “Why A Plastics White Paper?”
 - “Why Are California Plastics Policies Not Working?”
 - “What Should the State Do About Plastics?”
- Appendix A. *Use and Disposal of Polystyrene in California, A Report to the California Legislature*. This document is a report to the Legislature required by Chapter 406, Statutes of 2001 (Karnette, SB 1127). It covers polystyrene use, recycling, markets, disposal, environmental and health impacts, and policy recommendations.
- Appendix B. *Stakeholder Issue Framing Sessions and Responses to February 15, 2002, Solicitation for Input on Plastics Recycling Issues*. This appendix includes a summary of the numerous issue-framing sessions held with various stakeholder groups. It also includes written comments from stakeholders regarding their positions and opinions regarding plastics recycling and the white paper.
- Appendix C. *Background of The Plastics White Paper and June 24–25, 2002 Workshop*. This

appendix contains material related to the June 24–25, 2002, Plastics White Paper Workshop. This document includes extensive background research on plastic recycling, disposal, environmental issues, and international policies. This volume also summarizes white paper goals, scope of work, and the white paper study and report process.

- Appendix D. *Stakeholder Comments After June 24–25, 2002, Workshop*. This appendix contains

stakeholder comments and additional information in response to information presented by NewPoint Group at the workshop.

- Appendix E. *Stakeholder Comments to August 15, 2002, Draft Report*. This appendix contains stakeholder comments and additional information in response to the initial draft report and any relevant subsequent stakeholder comments.

Why A Plastics White Paper?

The California Integrated Waste Management Board and the California Department of Conservation commissioned this independent plastics white paper in order to help define current California plastics issues and explore future policy options for the State. The State of California is interested in increasing plastic recycling rates and the use of recycled plastics and in promoting plastics resource conservation.

Why are plastics targeted for this effort when other materials make up a larger share of California's waste stream? Plastics have drawn both strong positive—and strong negative—attention in their relatively short history. Examining reasons behind this attention helps explain why some have begun to focus on new plastics policies. This study will also help illuminate potential policy directions for the State to optimize use, recycling, and disposal of this ubiquitous material.

Plastics Use Is Proliferating, and for Good Reasons

Since the 1950s, plastics have grown into a major industry that positively affects all of our lives. Plastics contribute to our health, safety, and peace of mind in endless beneficial ways. The unique characteristics of plastics (light weight, durability, and formability) enable the material to be used in products ranging from coffee cups to automobiles that grace our lives on a daily basis.

Beginning in the early twentieth century, developments in the plastics industry have included such innovative new materials as Bakelite (1907), cellophane (1913), polyvinyl chloride (1926), polyethylene (1926), nylon stockings (1939), and Velcro (1957). These products were the start of a plastics revolution that continues today. In less than a hundred years, plastics have gone from a novelty specialty material developed in kitchen laboratories to an all-pervasive, multibillion dollar industry.

Figure 1: U.S. Plastic Resin Sales in Millions of Tons Per Year

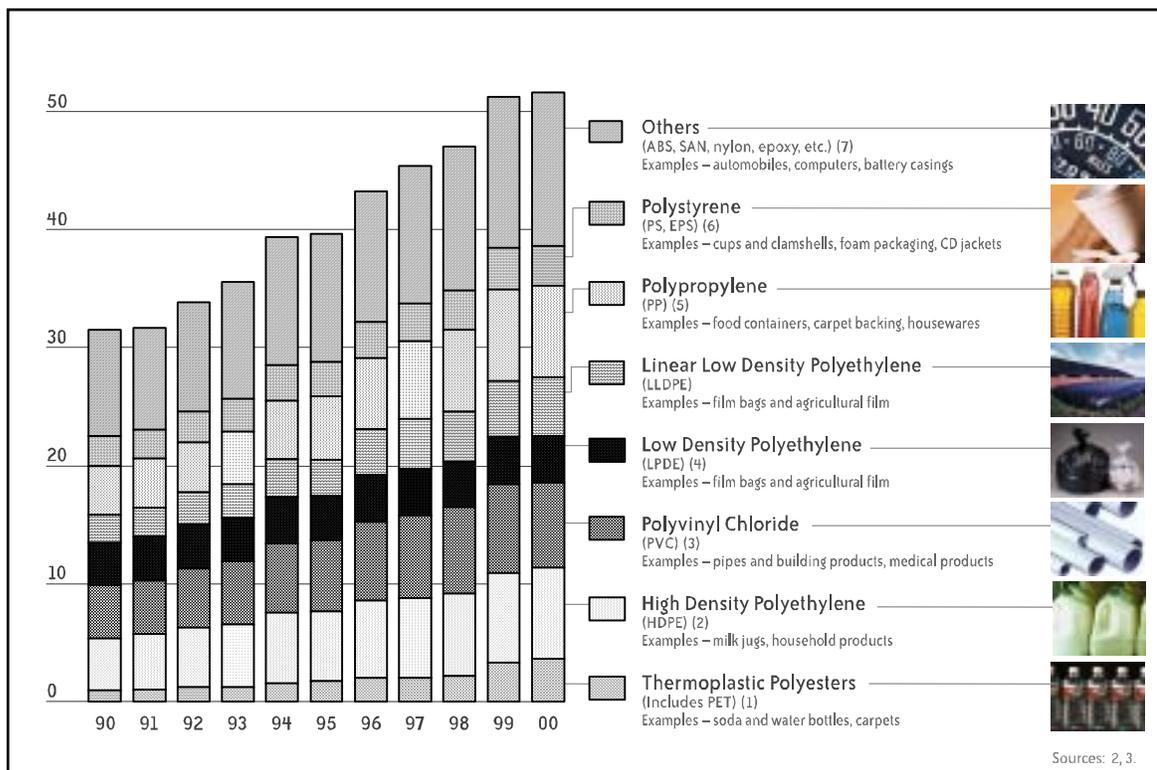
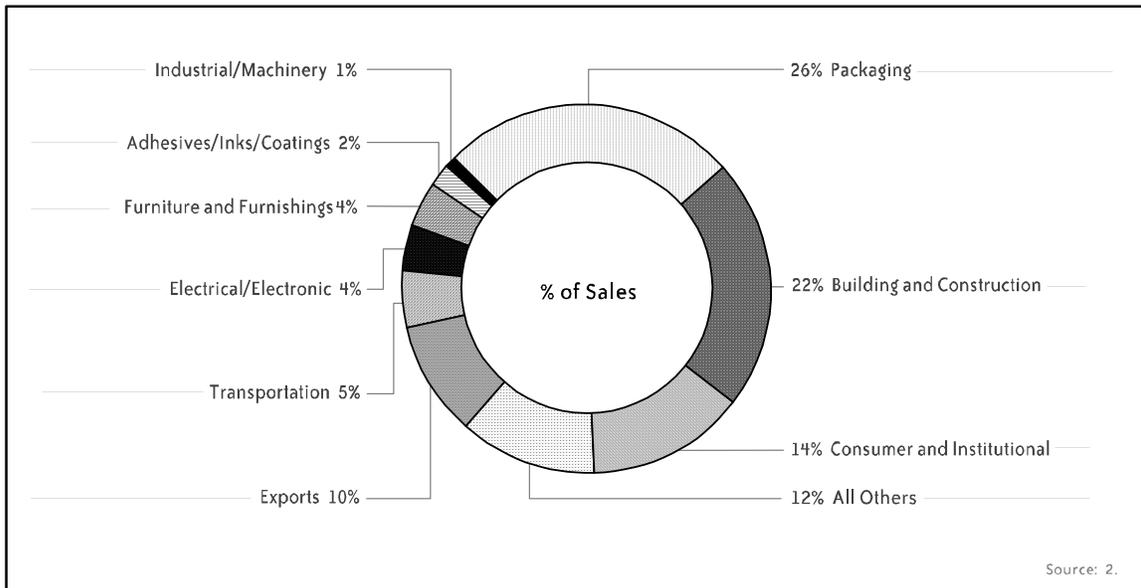


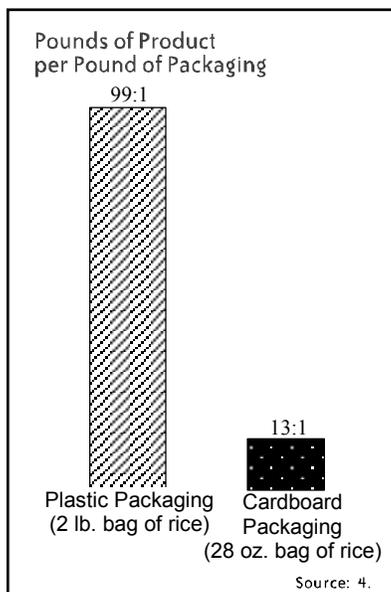
Figure 2. U. S. Plastic Resins by Category



Today, plastics are widespread in packaging, furniture, appliances, automobiles, buildings, medical equipment, toys, and a wide variety of industrial and consumer goods. Advances in barriers, colors, and resins are further expanding the applications of plastics, and new patents are

regularly granted for plastic polymers and uses. A key advantage of plastics is that minor changes in chemical structures can result in significant changes in material characteristics, making plastics one of the most versatile materials.

Figure 3. Source Reduction Properties of Plastic Packaging



Three members of the polyethylene family of plastics illustrate their versatility. Polyethylene terephthalate (PET) is clear, tough, provides a barrier to gas and moisture, and is heat-resistant. PET is used in drink bottles, injection-molded consumer products, and fiber applications. High density polyethylene (HDPE) is stiff and resistant to chemicals and moisture, but it is permeable to gas.

HDPE is easy to process and mold, and it is used in a wide range of products including bottles, tubs, and bags. Low density polyethylene (LDPE) is used predominantly in film applications because it is tough, flexible, and relatively transparent. Because of these properties, LDPE is also used in wire and cable applications.

Plastics have grown into a major industry in both the United States and California. Nationwide, the plastics industry is fourth in shipments among manufacturing industry groups, accounting for more than \$330 billion in shipments for 2000. California is one of the top states, with \$27.6 billion in plastic industry shipments, and 146,900 jobs. (SOURCE: 1)

Nationally, production of plastics has grown at a rate

of 4.9 percent per year since 1973, reaching sales of more than 50 million tons in 2000. (SOURCE: 2)

Manufacturers and consumers have widely embraced plastic products, ranging from plastic water bottles to toys to computers. The largest categories of plastic resin sales are packaging (26 percent), building and construction (22 percent), consumer and institutional (14 percent), exports (10 percent), and transportation (5 percent). (SOURCE: 2) In automobiles and other transportation applications, plastic resins are both light and strong, allowing for vehicles with increased fuel efficiency. Plastics provide structural and insulating qualities in a wide range of building applications, including pipes, carpets, insulation, flooring, and window frames.

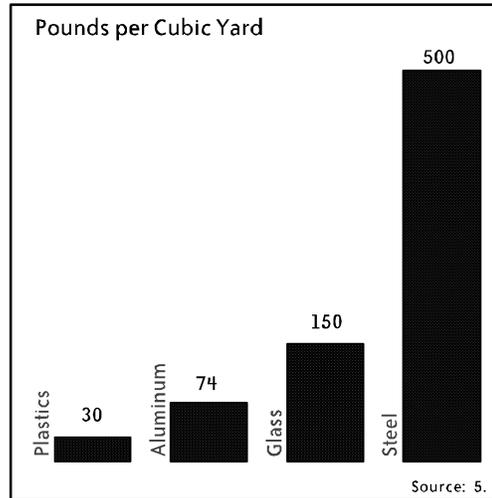
In packaging, plastics offer significant source reduction benefits, reducing the amount of material needed to supply a product while maintaining the functions provided by packaging. For example, a 2-pound plastic bag of rice has a product-to-package ratio of 99 to 1, while a 28-ounce paperboard box of rice has a product-to-package ratio of 13 to 1. Delivering 1,000 pounds of rice in plastic bags generates only 3.9 pounds of waste, while delivering the same amount of rice in paperboard boxes generates 78.1 pounds of waste. (SOURCE: 4) Plastics packaging also has itself been source-reduced over the years, with 2-liter soda bottles and gallon milk jugs about 30 percent lighter today than they were in the early 1970s.

Plastics play a significant role in reducing the amount of waste ultimately sent to landfills. The weight-reducing benefits of many plastics can offset the higher recycling rates of other materials. Plastics have greatly displaced many other materials in our economy over the last several decades. If plastics were not used, the quantity of other material to manage would have been even greater due to population and economic growth.

However, the dilemma of plastic is that its strengths (versatility and utility in a wide range of applications) are also in a sense its weakness. The proliferation and heterogeneous characteristics of plastic make it challenging to manage as waste.

Figure 4. The Low Density of Plastics Compared to Other Packaging Materials

The density of plastics is low, even compared to lightweight aluminum.



Plastics Disposal Is Growing Fast and Is Voluminous

As plastics are displacing heavier, less-flexible materials in packaging, building, transportation, and disposable products, the amount of disposed plastics is increasing almost as rapidly as production levels. As a result, plastics in the municipal solid waste discard continue to grow, and they are the fastest-growing portion of the municipal waste stream. An amount of plastics equal to almost one-half the resin produced each year now ends up in landfills. Nationally, plastics in the municipal solid waste (MSW) stream increased from 0.5 percent (390,000 tons) in 1960 to 13.8 percent (22.8 million tons) in 1999. This increase occurred following a rapid growth in plastics generation. (SOURCE: 8)

Plastics represent a disproportionate share of landfill space. Next to paper, plastics are the second-largest category of waste by volume going into municipal landfills. In California, plastics represent 8.9 percent of the waste landfilled by weight, an estimated 3.4 million tons in 2000.

Though light in weight, plastics is still the fifth-largest category of material by total weight in California's landfills. Plastics rank behind paper, construction and demolition waste, food waste, and yard waste. (SOURCE: 9) Because of its light unit weight,

plastics represents an even larger share of California’s landfill volume—perhaps twice as high a percentage of volume as compared to weight (or almost 18 percent by volume).

Plastics in California’s landfills fall into six main categories; film comprises by far the largest share. (SOURCE: 9) The next-largest single category of plastics is durable goods. However, the three container categories combined exceed durable goods by making up 21.4 percent of the plastics waste stream in California.

Plastics Recycling Is Lagging, and It Is Expensive

Plastics production continues to far outpace plastics recycling, and plastics are displacing some other more recyclable materials. Waste management systems have not been able to keep pace with the rapid increase in plastics use, which has garnered the attention of environmental groups and government policymakers. This has resulted in a patchwork of legislative attempts to manage plastics.

Plastics recycling started in the 1970s and is now an established industry for PET and HDPE plastics. Considering that a plastics recycling infrastructure did not exist before the 1970s, plastics recycling gains have been impressive. However, when compared with recycling of other material types—and with the relatively lower recycling rates of plastics—the plastics recycling gains are disappointingly slow.

The result is frustration from the plastics industry because its efforts to boost recycling (as well as promote the source reduction benefits of plastics) are not adequately recognized. Environmental groups and local governments are also frustrated because plastics recycling is difficult and expensive, and markets are inadequate. Bottle-to-bottle plastics recycling, until very recently, has been miniscule compared to other secondary material closed-loop recycling.

Most recycled plastics are PET and HDPE containers, accounting for slightly more than one-half of national plastics recycling in the last few years. (SOURCE: 8,15) Other categories of plastics recycled in significant quantities are polypropylene battery casings; HDPE, LDPE, LLDPE stretch-

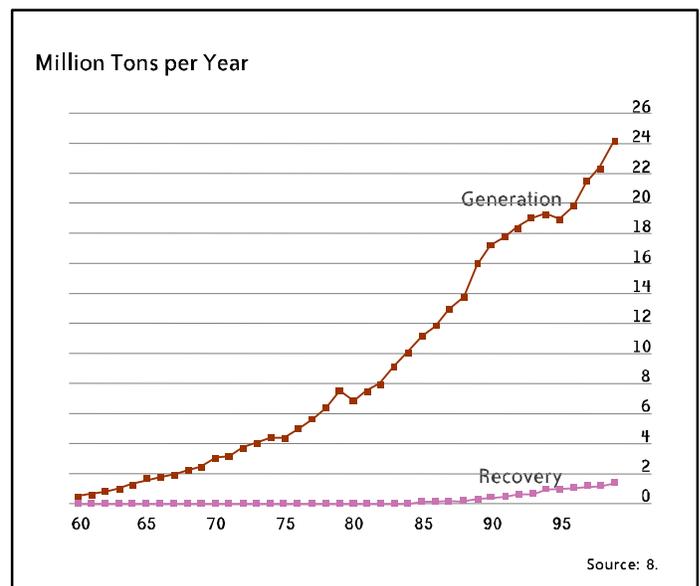
wrap and film; PET X-ray films; and polystyrene protective packaging. California has more than 1,800 recycling centers that collect plastics, in addition to 528 curbside programs, 241 processors, and 8 reclaimers. Approximately 60 plastic reclaimers operate nationwide, and capacity for recycled plastic bottles exceeds supply.

Plastics recycling in California, predominantly PET and HDPE beverage containers recycled under the State’s beverage container recycling program, has increased exponentially. The rate increased from 26.4 million containers in 1988 to 1.6 billion containers in 2001—a 60-fold increase. (SOURCE: 16)

Recycling rates for PET beverage containers peaked in 1994 at 71 percent. In recent years, with the addition of new containers to the program, the PET beverage container recycling rate has dropped to 36 percent. Plastic beverage container recycling rates could increase in a few years, once consumers and recyclers have assimilated all the new beverage containers incorporated into the California Beverage Container Recycling Act of 1986 (the “Bottle Bill,” sometimes referred to as “AB 2020”). These changes were incorporated with Chapter 815, Statutes of 1999 (Sher, SB 332).

Plastic bottle sales are increasing so rapidly that recycling rates simply cannot keep pace. For

Figure 5. Generation and Recovery of U. S. Plastics



example, bottled water sales—a PET bottle market that was virtually nonexistent 25 years ago—have been increasing at an annual rate of between 8 and 12 percent per year for the last several years. Bottled water is set to become the second-largest category of beverages sold by 2005, behind soft drinks.

The addition of new beverages—including bottled water—to California’s beverage container program in 2000 more than doubled the number of PET containers in the program. From 1999 to 2001, the number of PET beverage containers sold in the state more than tripled. While the number of PET beverage containers recycled increased by about 300 million in each of the last two years, PET recycling rates dropped from 65 percent in 1999 to 34 percent in 2000. PET recycling rates appear to be moving upward, increasing to 36 percent in 2001. (SOURCE: 16)

Overall, the plastics recycling rate has stagnated at a low level. Plastics recycling quantities and rates remain lower than other materials such as steel, aluminum, glass, and paper. Comparing CIWMB figures for the amounts in California’s landfills—and DOC figures for quantities recycled—plastic beverage container recycling in California does not compare well with other material types.

Aluminum is the only material that has a higher recycling rate than the amount disposed. Glass has a higher recycling rate than plastics. Only a little more glass is disposed than recycled, although demand for recycled glass currently exceeds supply. For both PET and HDPE beverage container plastics, much more material is disposed than recycled.

Figure 6. Recyclable Materials In California Landfills by Weight and by Volume, 1999
Plastics are ranked fifth by weight, but second by volume.

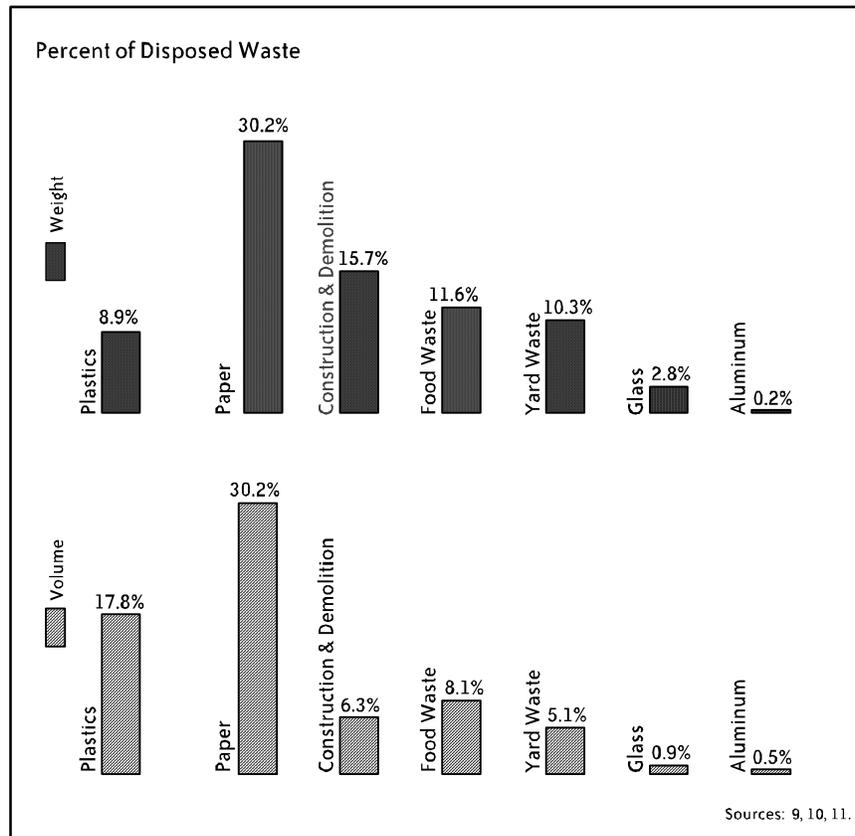
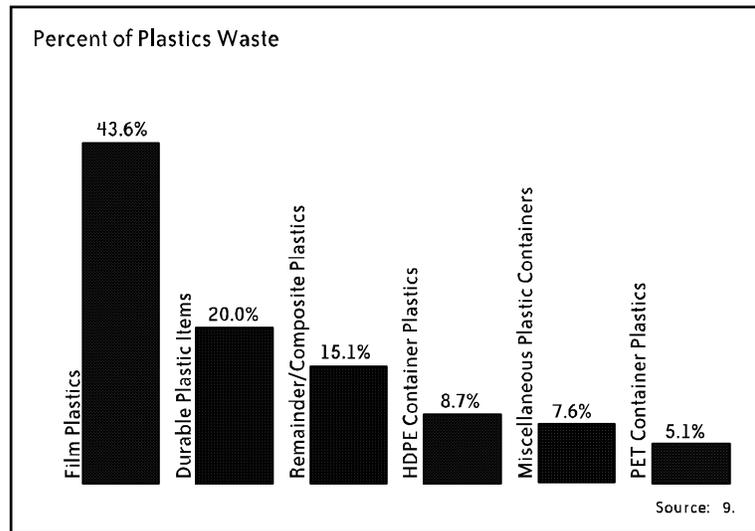


Figure 7. Film Plastics by Weight in California Landfills Compared to Other Plastic Types, 1998

Film dominates landfilled plastic.



Nationwide, plastic packaging resin sales are increasing about four times faster than the volume of plastic packaging recycled. Since 1995, U.S. plastic packaging resin sales (millions of pounds) increased at an annual average rate of 5.9 percent, while plastic bottles recycled (the majority of plastics packaging recycled) increased at an annual average rate of 3.4 percent. (SOURCE: 2,3,15) This is an increase in packaging resin sales of approximately 200 million pounds, and an increase in recycling of about 50 million pounds each year.

As with PET bottles in California, while the amount of plastics recycled is increasing, recycling rates nationally are not able to keep up with the rapid growth in sales. After a relatively large increase in plastics recycling rates from the mid-1980s to the mid-1990s, the total percent of plastics now recycled from the U.S. waste stream is relatively stable at just above 5 percent. (SOURCE: 8) The total percent of all materials recycled in the waste stream has followed a similar pattern but is stabilizing at a much higher 28 percent.

Figure 8. Recycling Rates of All California Beverage Containers

Plastic beverage container recycling rates are the lowest.

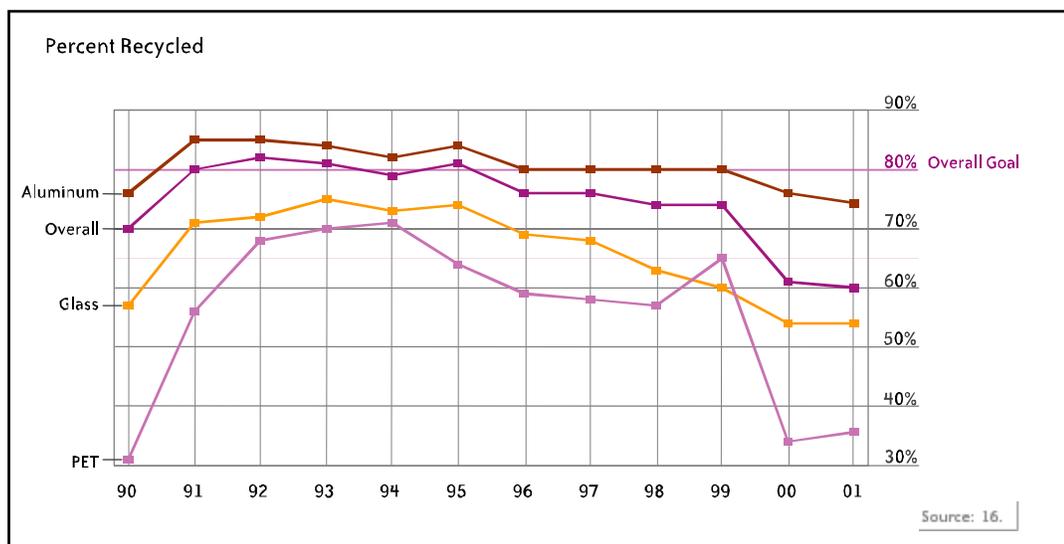
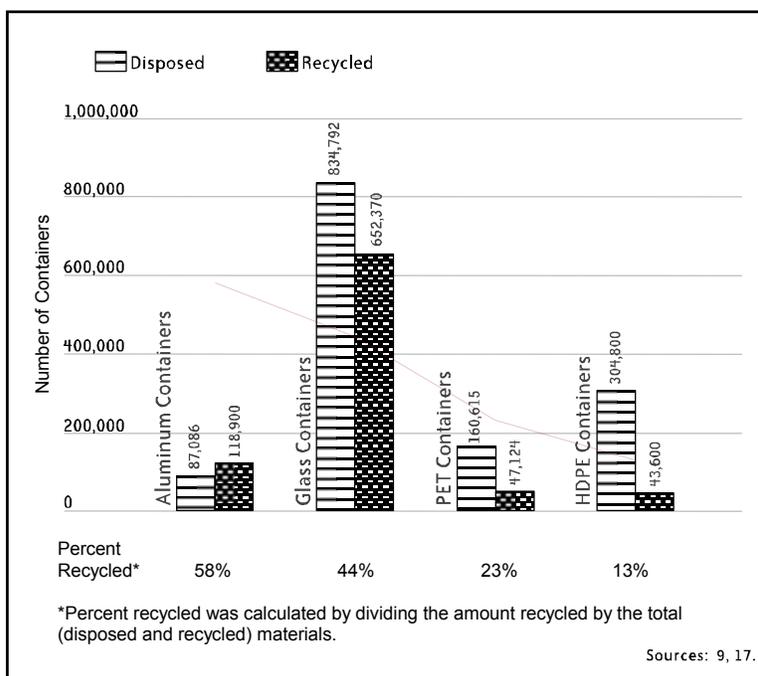


Figure 9: California Plastic Beverage Containers by Tons Disposed and Recycled and Percentage Recycled (2000)

More California plastic beverage containers are disposed than recycled, and more so than other material types.



Recycling nationwide and in California, in general, has declined. A July 9, 2002, *Wall Street Journal* article pointed out that for the first time in almost 20 years, the U.S. aluminum recycling rate is less than 50 percent. Even in bottle bill states, recycling is dropping off. (SOURCE: 18)

California's aluminum beverage container recycling rate is down to 75 percent, a drop from 80 percent two years ago. The *Journal* article blames the economy, people's lack of time, and Americans' on-the-go lifestyle for declining recycling. If aluminum—the most economically recyclable material—is now struggling, the recycling picture is not good for plastics.

Effective July 1, 2002, New York City terminated its plastic and glass recycling programs because of the costs of these programs. However, California has a unique Bottle Bill program with strong public support and perhaps a more environmentally conscious public than nationwide. But increasing recycling, especially plastics recycling, will not be easy in California.

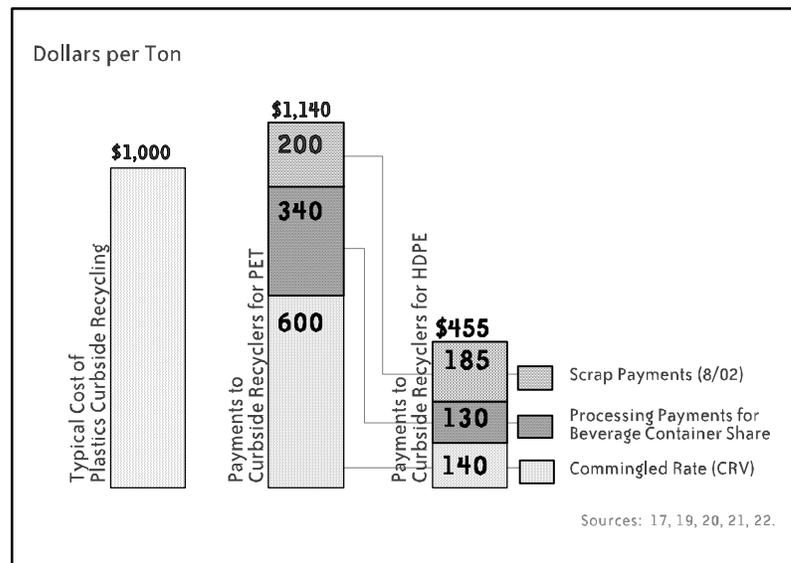
Plastics historically have been uneconomical to recycle. Average collection and processing costs exceed scrap values by more than two-and-one-half times without California Bottle Bill subsidies. Plastics are generally not as economic to recycle as other material types, and plastics recycling costs could increase further due to the proliferation of plastic container types. Higher plastics recycling rates come at a high economic cost, and higher than that for other material types.

Because plastics are lightweight and multiple plastic resin types require sorting, the costs of recycling plastics can be several times higher than scrap prices paid to recyclers. California has helped close this gap for beverage container recycling with the processing fee. Recyclers are essentially paid an additional \$470 per ton in processing fees for PET plastic beverage containers to cover the difference between their recycling costs and the scrap prices they receive.

This money currently comes primarily from unredeemed beverage deposits, and, to a lesser extent, from plastic container manufacturers. No -

Figure 10. Plastics Recycling Costs Compared to Plastics Values

The Bottle Bill (also known as AB 2020) supports plastics recycling in California. Without Bottle Bill payments, the costs of plastics recycling are much higher than the scrap values alone of most plastics.



California Bottle Bill subsidy safety net is available for non-beverage container plastics. The costs of recycling these plastics are high, often exceeding scrap values by several times. Even with the California Bottle Bill subsidies, local governments are losing money on plastics recycling. Using 2001 curbside recycling quantities and the costs and payments shown in Figure 10, curbside programs show a large net annual loss in millions of dollars.

Obtaining a sufficient quantity and quality of plastic materials is absolutely necessary for cost-effective recycling programs. Without sufficient quantities of plastic materials that can be collected, sorted, and cleaned at a reasonable cost, little incentive exists to recycle. In one sense, plastics collection must be efficient, but buyers must be willing to pay an amount at least equivalent to what the recycler spent to collect the material.

The reality often lies somewhere in the middle. Some plastics end markets are often insufficient to provide economic incentive for recyclers to collect and process the material to the necessary quality standard. To complicate the system further, manufacturers are adding new plastic resin types, barriers, and colors. Importers are bringing in plastic containers in less recyclable resins such as PVC, and the cost of plastics recycling rises.

Why Recycle Plastics?

While the direct economic costs for most recycling are high, recycling has broader environmental, economic, and social benefits that are not typically valued. Recycling can offer distinct advantages over disposal of materials, in both environmental and economic arenas.

Recycling plastics reduces the amount of natural resources extracted (natural gas and oil in particular). More than 95 percent of the total energy required to produce one kilogram of plastics goes into extraction and refining. Avoiding these steps by recycling can result in energy savings.

The U.S. Environmental Protection Agency (U.S. EPA) estimates energy savings from recycling four kinds of plastics ranges from 19 to 24 million BTUs per ton of plastics recycled. This is equivalent to about 150 to 200 gallons of gasoline per ton of plastics recycled. (SOURCE: 23) Studies have revealed reductions in air and water emissions when recycled plastics are used in production instead of virgin materials.

Recycling also creates jobs. Two recent studies on the economic impacts of disposal and recycling in California found that diversion (recycling or reuse) results in an average of 212 percent increase in sales

and public outlays as compared to disposal, a 165 percent increase in income, a 177 percent increase in value-added production, and a 190 percent increase in jobs. (SOURCE: 24) Diversion creates 4.7 jobs per 1,000 tons, while disposal creates 2.5 jobs per 1,000 tons.

Opportunities to Expand Film Collection and Recycling Exist In California

Film plastics are used in a wide range of applications, from food packaging to agricultural mulch film. Obtaining a clear picture of film production from existing data on film plastics production is difficult. According to American Plastics Council (APC) figures, an estimated 5.9 million tons were produced nationwide in 1999 from the major film resin types, LDPE, LLDPE, HDPE, PP, and PVC (data for film from other resins is not available).

Extrapolating downwards to California, this reveals 591,350 tons of plastic film produced for California sales in 1999. This sales estimate, however, is not consistent with waste disposal data for California, which shows that 1.38 million tons of film plastics were disposed. Of this 1.38 million tons, 56 percent

(772,721 tons) is from commercial and industrial sources and 41 percent (570,893 tons) is from residential sources. The remaining 3 percent of film disposed in California was from self-haul waste.

The Statewide Waste Characterization Study found eight industry categories that disposed of significantly larger quantities of film than the statewide average. These broad categories could be targeted for increased film collection.

Markets for clean plastic film have existed in California for several decades. According to one industry expert, at least 80 percent of the clean film generated statewide by larger sources (large retailers and industry), is already being collected and either used in products or exported. Plastic film end-users, processors, and exporters say they could all use more clean film, if it were available.

During the past few years, the biggest new market for plastic film, primarily polyethylene, has been composite lumber. Manufacturers such as Trex and Boise-Cascade (Marathon Recovery) are producing decking, siding, and other products using a mix of

Table 1. Percent of Plastic Film In Total Waste Disposed, By Industry Category

Industry Category	Percent Film in Total Waste Disposed	SIC Codes
Manufacturing, food/kindred	12.5 %	20
Transportation, other	8.5 %	40,41,44,45,47
Manufacturing, electronic equipment	8.5 %	36
Combined categories (includes agriculture; some manufacturing)	8.4 %	Several
Wholesale trade, nondurable goods	8.0 %	51
Retail trade, food store	7.1 %	54
Manufacturing, industrial/machinery	6.5 %	35
Services, business services	6.4 %	73

plastic and wood (typically sawdust). These markets have less stringent quality standards than for film applications such as trash bags, and they can be less selective in the materials accepted.

Composite lumber manufacturers are competing with each other for recycled plastic film by setting up milk-run collections and collection systems in larger retailers such as Safeway, Albertson's, and Vons. Many large retailers and manufacturers already have collection systems in place for clean film, although statewide numbers are not available.

The State could further support existing film collection by expanding publicity and education about plastic bag take-back programs. Many large retailers accept plastic bags for return, which are then collected and back-hauled to distribution centers and combined with stretch and other film for composite lumber. Keeping the recycled film separate from other materials is important. Once film has been combined with other recycled materials, or put in joint collection bins, the material is almost always contaminated. This plastic film is difficult and expensive to clean and use.

Film recycling could be increased in two key areas: agricultural film, and the smaller retail and distribution industries not currently large enough to have economically viable collection systems in place.

Agricultural film—including fumigation films, mulch film, greenhouse film, and irrigation drip tape—is generated seasonally in California. Disposal of this material is becoming increasingly difficult for farmers, and some landfills will not accept the material. Farmers are looking to their film suppliers to help provide disposal or recycling services for the material.

State support could be beneficial in this area, especially in permitting and siting facilities to clean and process agricultural film. Collection of agricultural film is relatively straightforward, with systems in place to apply and remove film. Agricultural films may be contaminated with dirt or pesticides, so cleaning systems are necessary to make these films suitable for most uses (although conversion and some other technologies might be able to use contaminated film).

The second key untapped area for film recovery is retailers and manufacturers. Medium and small operations do not currently generate enough clean film to make collection efficient either for them or end-users such as the plastic/composite lumber industry. Thus, little incentive exists to establish collection programs like those in place for the larger generators. While each location may generate a relatively small amount of film, cumulatively the statewide total could be significant.

Further State assessment of the potential of collection systems, milk runs, or back-haul systems within this industry segment could lead to diversion of more film statewide. The Alameda County Waste Management Authority is supporting plastic film collection among smaller generators in a program that could be modeled statewide.

A third category of film generation is household film. More than 40 percent of film disposed statewide is from residential sources. This film is typically dirty, consisting of a wide variety of films ranging from chicken wrappers to plastic bags. Until general household and yard waste biodegradable plastics and composting facilities are commercially available, diversion of conventional film plastics may be limited to conversion or other technologies that do not require cleaning or sorting. Once new technologies are in place, curbside programs or local drop-off programs could provide residential plastic film collection, for either conventional or biodegradable film plastics.

Like other plastics, the key to conventional plastic film recycling is quantity and quality. The first tier of large-quantity and high-quality film is already being collected and used in products. If the State wants to divert more film from landfills, it must begin to look at the next levels of film collection. Agricultural film has high quantity but is dirty; smaller retailers and manufacturers have smaller quantities of clean material. Recycling film plastics from both of these categories will provide challenges. But if stakeholders promote appropriate collection and/or cleaning, effective systems can be put in place to tap into these markets. This will divert significant quantities of conventional film plastics. (SOURCES: 2, 9, 12,

13, 14)

Plastics Markets are Dynamic, Limited, and Volatile

Plastics is a global commodity, subject to the volatility of world economic forces. California is dependent on the plastics export market. While the California domestic market could absorb more recycled plastics material, often the export market pays a higher price for recycled plastics.

A goal of some existing California plastics laws is to create markets for recycled resins. Unfortunately, plastics market drivers, in most cases, go far beyond California's reach. Three primary factors influence virgin resin prices, which in turn influence the price manufacturers are willing to pay for recycled resins: (1) the price of natural gas and petroleum, (2) available virgin resin production capacity relative to demand, and (3) general economic conditions. Besides virgin resin supply and prices, other factors influencing recycled resin prices include the supply and prices of industrial scrap or off-spec material.

There is often a disconnect between supply and demand of recycled plastics. If a plastics material is to be collected for recycling, viable markets must be present. If viable markets are to exist, a sufficient quantity and quality of recycled material must be available for purchase at a reasonable price. Again, this often leaves a gap. As a result, some plastics that are collected for recycling may end up in the landfill. Recyclers complain of inadequate markets for some of the plastic materials they are collecting, and manufacturers complain of insufficient high-quality recycled plastics to meet their needs.

Quality of the recycled plastics material as compared to virgin grades is an issue that affects markets. Plastics are more difficult to clean than other recycled materials because of their low melting temperature. Contaminants such as other resin grades (especially PVC), colors, grit, dirt, labels, residues, and metals require extensive sorting and cleaning. If not removed, the contaminants reduce the value of recycled plastics.

The impact of plastics packaging innovations has increased the costs of sorting plastics and reduced the market price of recycled plastics. These innovations include barriers, tints, and expanding single-serve container markets.

Virgin resin prices are generally low. If virgin resin—even of a low grade—is available for a similar price, there is often little incentive to use potentially contaminated recycled plastics material.

Much of the plastics collected for recycling in California is exported to Pacific Rim countries, often generating a slightly higher price than elsewhere in the United States. In 2001, the majority of PET plastics—about one-half of the HDPE collected in California—was exported. This figure represents almost all the injection-grade and resin types #3 to #7 plastics. (SOURCE: 25)

This high reliance on plastics export markets is a concern because export markets are inherently unstable, and Asia's demand for California's recycled plastics may not last. China is increasing production of virgin PET plastics and is beginning to ship more PET products to the U.S. This has reduced China's demand for recycled resin.

Like the plastics industry itself, plastics recycling technologies and markets are continuously evolving, and viable new recycled plastics markets of any kind should be encouraged. A prime example is the current market for plastics film through composite lumber producers such as Trex and U.S. Plastic Lumber.

This relatively new industry segment is collecting large quantities of plastics film, often of relatively low quality, for use in composite lumber products. Recycling plastics from automobile shredder residue, to be used again in automobiles, is another potential growth area in recycled plastics. Products made from these materials have a ready market.

Exciting advances have taken place in the use of recycled plastics in bottle-to-bottle applications, both in HDPE and PET bottles. Both Coca-Cola and Pepsi have recently committed to using 10 percent postconsumer resin (PCR) in the production of soda bottles by 2005. These companies currently use recycled resin in some products, and their expanded use will help spur domestic markets for recycled PET plastics.

Pepsi President and CEO Gary Rodden commented to bottlers on the new policy: "We currently use recycled content in both aluminum and glass containers, so it makes sense that we explore the

potential of using recycled content in our growing line of plastic bottles.... We know that it is technically and economically feasible to produce a food-grade container made with 10 percent recycled content, so we believe achieving that rate is a reasonable action.”(SOURCE: 26)

There is still concern about potential contamination from the use of some PCR in food contact applications. While this may be relevant for some other plastic resins, recycled PET plastics use in food and beverage applications is a big potential growth area for PET plastics.

What is often considered the “top” of the recycling hierarchy is closed-loop, or bottle-to-bottle recycling. The perceived advantage of closed-loop recycling is that the used bottle goes back into the creation of a new bottle, and the cycle continues indefinitely, reducing the total amount of new resins going into single-use products.

Open-loop recycling is typically the most common approach for plastics. In this case, the recycled bottles are used to create new products, such as fiber, plastic lumber, computer components, furniture, buckets, bins, drainage pipes, videocassettes, and carpet. These products are typically not recycled, so some argue that open-loop recycling does not keep material out of the landfill as effectively.

Because many open-loop products take years to reach the landfill, the end result of either plastics recycling approach can be positive from a resource conservation perspective. An advantage of closed-loop recycling in current markets is that the higher quality bottle-grade recycled resin demands a higher scrap price than other uses. This helps to close the gap between the costs of collecting and recycling plastics and the price paid for the material.

Plastics Use Has Significant Unintended Consequences Not Fully Recognized

The rapid growth of plastics use has had a cumulative downside. Plastics are used in many beneficial ways, but they are also everywhere else—in waterways, beaches, roadsides, and parks. Even at some landfills, plastics may be blowing around in the wind.

The plastics litter problem is becoming increasingly difficult to manage. This problem has costly negative implications for tourism, wildlife, aesthetics, boating, and most recently in California, public storm drain systems. The unintended consequences of plastics use is resulting in high social and economic costs—externalities—that are born by society and government in general, not by those directly responsible for the original plastics production and subsequent usage.

Litter is a pervasive problem involving diffuse sources and human behavior, and there are no easy solutions. A principal tenet of this issue is that litter is not a problem caused by specific materials, such as plastics; rather, litter is caused by human behavior. Attributing the litter issue to one particular packaging material does not solve the litter problem, because another type of packaging will take its place as litter unless human behavior changes. However, plastic policies still need to address the issue of plastics litter entering and persisting in the environment. Litter and plastics are fast becoming synonymous.

Litter is obviously not a plastics problem alone, and the fact that litter has been a public concern for decades points to the general difficulty in addressing this policy issue. However, plastics makes up a big portion of litter, and plastics characteristics make plastics litter particularly problematic.

While plastics may break into smaller pieces, plastics do not effectively biodegrade in the environment—they last for decades, so every piece of plastic that has been littered (and has not been picked up or eaten by wildlife) is still in the environment. Many plastics also are relatively light—they float in water and are easily blown in the wind from place to place. Other plastics sink in water, where they are eaten by lobsters, flounders, and other marine life. Unlike other types of litter, plastic is highly mobile.

Degradation of materials is sometimes seen as an impractical or non-functional technique for alleviating litter problems at this time. Instead, consumer education and awareness appear to be the best solutions to effectively address land-based litter concerns. This may be true, but plastics still have undesirable litter properties that need to be addressed.

Plastic is a major component of litter. Almost 90 percent of floating marine debris is plastic. Plastics are by far the largest category of litter in nationwide coastal cleanup programs, and plastics make up between 30 and 80 percent of roadside litter collected. (SOURCE: 27) While marine debris creates the most costly problems, 60 to 80 percent of marine debris originates from land-based activities. (SOURCE: 28)

The effects of plastics on marine wildlife are well documented—particularly problems arising from ingestion or entanglement. Scientists also are identifying new areas of concern related to plastics litter, including the adsorption of toxic substances in seawater into plastic resin pellets. Many of these pellets and particles act as bioaccumulators for hydrophobic toxins such as PCBs and others. These contaminated pellets and particles are then ingested and transmitted throughout the marine food chain.

Invasive species such as barnacles, mollusks, sea worms, and corals are transported to islands and other sensitive ecosystems, traveling on plastic litter “boats.” (SOURCE: 29) Once established, invasive species are almost impossible to remove, and they often result in devastating environmental and economic impacts. Plastics litter also causes quantifiable economic damages to fishing and recreational boats.

(SOURCE: 30)

Of immediate concern to California are the implications of plastics litter on water body segments. In 1998, a coalition of environmental organizations filed suit against the U.S. EPA for not developing pollution control plans for impacted waterways in the Los Angeles Region (Heal the Bay, et al. versus Browner, Case No. 98-4825 SBA). The suit resulted in the signing of a consent decree on March 22, 1999. As a result, the Los Angeles Regional Water Quality Control Board adopted a zero tolerance policy for litter entering its region’s waterways through the stormwater system. This means that, after a 13-year phase-in period, no litter greater than 5mm in diameter will be allowed to pass into, or through, the Los Angeles Region’s stormwater systems.

Currently, plastics is a major contaminant in stormwater runoff. Los Angeles County alone spends \$1 million a year on beach cleanups after storm events, when beach litter is at its worst. Los Angeles County could be required to spend as much as \$400 million in 12 years to trap litter in its storm system before it reaches the waterways and beaches.

(SOURCE: 31) Some cities in the Los Angeles region are actively pursuing stringent solutions for plastics litter stormwater runoff, including banning the sale of some plastic products.

Litter is not the only unintended consequence of

plastics. Plastics are made from oil or natural gas. While only a small portion (3 to 4 percent) of oil production ends up as plastics, the production of plastics may have impacts. This includes chemicals and additives incorporated into plastics. The potential health and environmental impacts of plastics are an area of controversy, but



Unintended Consequences of Plastics Use

Plastics litter is predominant in California’s storm drain runoff.

Source: 24.

there are a few definitive answers at this point. Some types of plastics or additives appear to be problematic, and research is ongoing to determine or identify these problems. (SOURCE: 32)

Meanwhile, some environmental groups, such as Greenpeace, argue to reduce or eliminate plastics use. Others, such as the American Plastics Council, stress the positive benefits of plastics. Because of the polarized rhetoric on both sides, the true extent of plastics problems is difficult to determine. If such problems do occur, the risks may not have been previously known.

Plastics risk areas that are currently under examination include the production, use, and disposal of PVC, brominated flame retardants (PBDE), and additives such as phthalates (DEHP). PVC is of additional concern because it is a contaminant in PET recycling.

The Office of Environmental Health Hazard Assessment (OEHHA) is conducting a risk analysis of PVC for the CIWMB. Both agencies operate under the California Environmental Protection Agency (Cal/EPA). Research efforts and campaigns are taking place at the national and international levels to examine many of these issues.

In terms of immediate public policy implications for California, solid information is currently insufficient to make policy decisions regarding the potential health and environmental impacts of plastics. Accordingly, the promotion of research initiatives and sound, unbiased information sharing should continue.

Plastics Resource Use Is Not Being Effectively Managed

Inventions of the twentieth century, plastics are everywhere. Society has found ample ways to use plastics. But users are less adept at managing the material when they are finished with it—often after only one use. The volume of plastics being produced, used, generated, and discarded is greater than ever before. Plastics therefore require increasing effort and ingenuity to properly manage.

Plastics waste managers today use at least five distinct plastics management tools. New options are being developed every year to effectively manage

plastics that may make some of these strategies obsolete.

First, some plastics can, and should, be reused. Second, some plastics should be recycled back into containers, or other products. Third, some plastic products should be made biodegradable and collected for composting (this assumes the necessary collection for composting facilities). Fourth, some plastics that are uneconomic to recycle should be converted to fuel (this assumes the necessary development of technologically and economically feasible conversion facilities). Fifth, some plastics should continue to be disposed, since collection and sorting of these plastics is currently too difficult or costly.

Today, far too many plastics are disposed with inadequate or no use of the other four plastics management tools. As a result, we are not managing plastics as effectively as we could, and are thus losing opportunities to conserve resources. We cannot keep disposing and discarding plastics into the environment at the rates of the last 30 years. Plastics accumulation may cause more costly economic and environmental solutions later if not properly managed now.

Resource conservation is a goal that underlies the missions and policies of California's solid waste management agencies. Resource conservation is the careful use of a natural resource in order to prevent depletion. It is the act of conserving through preventing injury, decay, waste, or loss of resources.

A significant component of resource conservation is using less material—source reduction—in which plastics play a major role. Source reduction is at the top of the waste management hierarchy, and plastics need to be explicitly recognized for their source reduction benefits. With the widespread use of plastics in hundreds of applications, we are definitely able to do more with less plastics material.

However, simply switching to plastics from other materials and thereby claiming an environmental victory due to a reduction in the amount of material discarded is not a sufficient response. The responsible steps in the new plastics waste management hierarchy should be to reuse, recycle, compost, or convert the material whenever technically and economically feasible.

Life Cycle Assessment (LCA) Can Be An Informative Tool But Should Not Exclusively Be Used for Public Policy Decisions

Life Cycle Assessment (LCA) is a technique for assessing the environmental aspects and potential impacts with a product by (1) compiling an inventory of relevant inputs and outputs of product systems from “cradle to grave” (raw materials acquisition, manufacture, processing, formulation, distribution and transportation, use, reuse, maintenance, recycling, and waste disposal); (2) evaluating the potential environmental impacts associated with those inputs and outputs; and (3) interpreting the results of the inventory analysis and impact assessment phases in relation to the objectives of the study.

The first life cycle analysis (which in today’s vernacular was an LCA inventory study) was conducted in 1969 by the Coca Cola Company to determine which type of containers were most environmentally sound. Since then, numerous LCA inventory studies have been conducted worldwide. A number of organizations in the United States have conducted LCAs on products such as beverage containers, bags, diapers, and milk containers.

The Society of Environmental Toxicology and Chemistry (SETAC) developed a technical framework for life cycle assessments in August 1990. U.S. EPA developed an LCA inventory document in 1991 (Product Life Cycle Assessment: Guidelines & Principles, Battelle & Franklin Associates), and then the methodology was standardized globally through ISO (the International Organization for Standardization).

Starting in 1993, experts from 29 countries—including the U.S.—have developed and adopted the ISO 14040 environmental management series of LCA standards. These standards consist of the following: (a) ISO 14040 LCA principles and framework (adopted 1997); (b) ISO 14041 LCA goal and scope definition and inventory analysis (adopted 1998); (c) ISO 14042 LCA life cycle impact assessment (adopted 2000), and (d) LCA interpretation (adopted 2002). These standards were based on European, U.S. and other countries use of LCA since the 1960s.

LCA is seen as a valuable tool for considering the different impacts across the life of a product or

package. However, those who interpret the results should be careful and should not rely on LCA as the single methodology or tool for setting public policy.

In reality, the results of LCA studies are seldom clear-cut. The analysis (interpretation) of the trade-offs of various product systems often fail to reveal clearly which product system is “better” for the environment. Despite the ISO standards for LCA methodology, LCA databases (and data quality) will vary. One problem with LCA is the wide range of study results (often depending on who is funding them).

For example, a 1988 NAPCOR study comparing soda containers found 2L PET and 12 oz. aluminum better than refillable glass at existing tipping rates. The study found PET and aluminum equivalent on air emissions. The study revealed that PET and refillable glass are nearly equivalent on water emissions, and PET and refillable glass are nearly equivalent on energy consumption. A 1976 study by the Federal Energy Administration evaluating energy consumption of soft drink containers ranked plastic bottles second behind refillable glass. But this study assumed only a 25 percent recycling rate for aluminum.

A 1974 study by Franklin Associates for the U.S. EPA ranked plastic bottles fourth in the amount of water needed to produce, package, and deliver a beverage to consumers. A 1991 study by Franklin Associates examined only the energy used to produce plastic packaging and disposable products as compared to alternatives from other materials. They quantified total energy use at each manufacturing stage and found that 336 million fewer BTUs were required to produce plastic packaging than would have been required to produce the non-plastic alternatives.

The majority of the savings (78 percent) were from energy savings from the use of film, compared to alternatives such as kraft paper, wax paper, tissue, and foil. Savings were less significant, or even negative when comparing the energy use of disposable plastics such as cups and plates to the alternatives.

Continued on next page

Life Cycle Assessment, *continued from previous page*

Similarly, studies of milk delivery packaging in Europe and Canada found different container types ranked higher or lower. Rankings depended on what factors were evaluated and what assumptions were made about waste, sources of energy, and package design.

Another reason LCA should not be used as the only public policy tool is the limitation of the scope and boundary of the tool. For instance, LCA assumes “compliance” with environmental regulations. It does not take into account excursions or violations—exceeding water or wastewater discharges, littering, etc. While the methodology does include the “use phase” of product systems, the actual use of the material may have more significant impacts—and wider variation in impacts—than how it was produced.

For example, LCA studies assume that the container is discarded properly for recycling or disposal. If the container is littered and ends up in the storm drain, the potential negative impacts are much higher.

Another limitation of LCA is how impacts are considered sometimes globally, rather than regionally or locally. Energy inputs vary from country to country, from location to location, and aggregated or average grids are not always as indicative as more accurate local conditions.

Taking these into account could lead to different conclusions about the “best” package or product.

A European packaging industry group states that the differences in LCA analyses between various packaging types are not significant—certainly not significant enough to base public policy decisions: “The difference on environmental grounds between one type of packaging and another is too small to be meaningful—often the difference between the same types of packaging produced in different plants is greater than the difference between types of packaging.” (SOURCE: 7)

Manufacturers and research groups should continue to use LCA for improvement purposes to evaluate and compare product systems to better understand their impacts and how to minimize them. Government agencies, including U.S. EPA’s Environmentally Preferable Product (EPP) guidelines, are incorporating LCA into the procurement process as a way to help federal agencies determine the environmental preferability of products. Along with product specifications, costs, and environmental labeling, LCA can offer the trade-off analysis to help minimize energy and environmental burdens of product systems. LCA is not a tool that should be used as a basis to either justify or ban certain plastic materials. (SOURCE: 6)

In particular, one-time use plastic products and packaging are not being adequately addressed. Packaging plays a vital role in the delivery of consumer goods to the public. It is essential for safety, transportation, convenience, consumer acceptance, containment, protection, communication, and utility.

The proliferation of plastics packaging and disposable products is growing more rapidly than our ability to effectively manage these materials. The result is more plastic materials being discarded—either properly or improperly—and more plastic materials are entering our landfills and environment. Again, plastics are not the only material causing these concerns, but they are the most rapidly growing material, and thus garner and warrant the most attention.

California is currently struggling to effectively manage plastics within the conventional waste management hierarchy. Non-plastic materials are much more homogeneous in nature and more receptive to this traditional framework. The State must now broaden its management approach to plastic materials that are highly heterogeneous in type and application. Reuse, recycling, composting (of biodegradable plastics), and plastics conversion technologies—all where proven technologically and economically feasible—can keep plastics in the economy and in the materials-use cycle. These activities can also keep plastics out of California’s landfills and out of the environment.

Ample opportunities are available to increase plastics recycling in California. In many applications, recycling is an effective waste management tool for

the growing plastics waste stream. The State should take advantage of opportunities to promote plastics reuse and the use and composting of biodegradable plastics. Conversion technologies can keep plastics out of landfills, while creating a valuable fuel product. Since plastic materials have inherent value as a material or a fuel, they should not be disposed—especially when the environmental costs of disposal and discard are high.

Plastics Present a Timely Public Policy Challenge

Plastics in some form or another are here to stay in our lifetimes, since they are integral to our lifestyles and economy and they have large societal benefits. However, on the other side of the scale, there are significant economic externalities in the plastics production, use, recycling, and disposal lifecycle phases. (These include litter, marine ecosystem impacts, known/unknown chemical emissions, and other potential health risks). The benefits of plastics must be brought into balance with the full economic and environmental costs of plastic.

Many of the long-term plastics structural issues (general uneconomical recycling opportunities and relatively low recycling rates) have not changed materially in the last 20 years. Going forward, optimizing plastics use, recycling, and disposal in California will require a significant shift in public policies.

A number of public policy challenges come with the use and disposal of plastics. The conventional resource policy of “reduce, reuse, and recycle” has made an impact on the environmentally sound disposal of plastics. But ultimately, most single-use throwaway consumer and commercial plastic products end their life in a landfill.

California is now at a plastics crossroads, a renaissance of sorts, of new and exciting potential changes to plastics policies and technologies. Government/industry collaborative partnerships, and smart public policies, can help optimize our plastics use, recycling, and disposal in California.

Why Are California Plastics Policies Not Working?

California has four major existing environmental laws that relate to plastics. Three of the laws, the California Integrated Waste Management Act (IWMA), the Rigid Plastic Packaging Container (RPPC) Act, and the “Plastics Trash Bag Law” (Chapter 1096, Statutes of 1993, Hart, SB 951) are under the jurisdiction of the CIWMB. The fourth law, the California Beverage Container Recycling and Litter Reduction Act of 1986 (“Bottle Bill,” or sometimes called “AB 2020”), is under jurisdiction of the Department of Conservation. These four laws, both individually and combined, are flawed with regard to effectively managing California’s plastics. Hence, the State’s plastics issues are not being adequately addressed.

Plastics Have Not Been Effectively Incorporated Into California’s Integrated Waste Management Program

The IWMA established a new approach for

managing California’s waste stream, one that created a hierarchy of waste prevention first, followed by recycling and composting. Central to the IWMA was the mandated goal of 50 percent waste diversion from landfills generated within each city/county jurisdiction. The legislature amended this statute in 2000, requiring jurisdictions to sustain their waste diversion efforts into the future.

There are several successes and failures of IWMA recycling and landfill legislation, as it relates to plastics. IWMA compliance requires that all city/county California jurisdictions meet the 50 percent diversion goal.

The IWMA is strictly a weight-based system that does not favor plastics recycling in relative terms of helping to meet overall IWMA goal attainment. Heavier materials, like paper, and construction and demolition (C&D) debris, provide more potential diversion credit. Paper is approximately 30 percent

The IWMA: Recycling and Landfill Legislation

Successes

- City/county jurisdictions have achieved diversion rates by tailoring waste handling infrastructure options that include curbside recycling, materials recovery facilities, and composting operations supported by waste prevention and public education efforts.
- The State’s diversion and recycling infrastructure now represents an investment of hundreds of million of dollars of public and private sector funds. California’s reuse and recycling industry employs more than 60,000 workers, with a payroll of several billion dollars.

Failures

- Although the State has not met its overall 50 percent waste diversion goal, some jurisdictions have met or exceeded the 50 percent goal. As of April 2003, the Board has confirmed that 206 jurisdictions met or exceeded the 50 percent waste diversion goal in 2000. This number is less than half of the 445 reporting jurisdictions. (SOURCE: CIWMB WASTE ANALYSIS BRANCH)
- California jurisdictions have not met their 50 percent diversion mandate for the following reasons, among others:
 - The state’s economy soared in the 1990s. This increased estimated waste generation nearly 50 percent, from 45 million tons in 1989 to more than 66 million tons in 2000.
 - The costs for collecting and sorting recyclables of sufficient quantity and quality are relatively high, and maintaining markets for recyclables is an ongoing challenge.
 - The original 50 percent waste diversion goal is ambitious.

by weight, and C&D debris is 15 percent by weight of California's disposed waste.

Plastics make up only 8.9 percent of total California disposed waste weight (versus an estimated 17.8 percent by volume). Also, the built-in incentive of the IWMA to maximize weight quantity diverted, rather than quality collected, is generally counter to market demands for plastic recyclable materials.

Plastics recycling does contribute some towards IWMA diversion. As a result of the IWMA and the California Bottle Bill, most local California jurisdictions have chosen to expand their curbside programs to include plastics recycling. The jurisdictions have done this despite the high cost and difficulty of marketing some of their collected plastics material.

Curbside recycling, promoted under the Board's IWMA programs, is heavily dependent on the DOC's Beverage Container Program, which stems from the California Bottle Bill. Communities must collect all plastic resin types in their curbside programs to access curbside assistance payments (California Redemption Value) from the DOC.

However, of the seven major types of plastics packaging (classified by the Society of Plastics Industry), only two resin types, #1 and #2 (PET and HDPE, respectively), are actually recycled at the curb to any significant degree in California. Most California cities and counties now have some kind of curbside collection program that includes #1 (PET) and #2 (HDPE) plastic bottles. While most jurisdictions also collect plastic resins #3 through #7, these other resin quantities collected are minimal.

In California, the costs to collect PET and HDPE plastics at curbside are offset by a combination of market scrap value, Bottle Bill processing, and CRV payments. The effective plastics economics of California's curbside collection programs are highly dependent on payments from the Bottle Bill program.

For PET plastics from curbside, local operators receive scrap value (currently approximately \$0.10 per pound), plus \$0.30 per pound in CRV payments and a processing payment of \$0.235 per pound (for the CRV proportion only). These total PET plastic revenues amount to approximately \$1,140 per ton

(for beverage and non-beverage CRV) and currently offset costs to collect and process PET plastics at the curb. HDPE plastics also have a commingled rate for curbside collected material. Thus, curbside operators can collect both CRV and processing payments for HDPE as well.

The costs of collecting, sorting, and marketing non-beverage container plastic resins #3 to #7, generated in some California municipalities, is not economical. Collecting these resin types can be financially cumbersome. Some California municipalities may collect and sort these other non-beverage container resins only to have them landfilled, much to everyone's disillusionment.

Plastics curbside recycling is confusing to the general public and even to "professionals" in the field. Wide variation is present among local governments in both the types of plastics collected and the way they are collected.

Some municipalities, like Sacramento County, collect only narrow-necked #1 and #2 plastics (includes soft drink bottles, water bottles, milk jugs, shampoo and conditioner bottles, and detergent and bleach bottles). Other municipalities, like the neighboring City of Sacramento, collect #1 and #2 plastic containers, and all CRV containers, including plastics #3 through #7. Neither the City nor the County of Sacramento accept plastic bags, polystyrene plastics, plastic food trays, or plastic cups.

Both the County and City of Sacramento systems use "mixed recycling" methods, which involve tossing all recyclables into a single large bin rather than requiring residents to separate plastics, aluminum, glass, and paper. Still other non-Sacramento communities currently require some separation of recyclables. In January 2002, only approximately 2 percent, by weight, of the mixed recycling materials in the City of Sacramento was plastics.

Some major communities around the country, such as the City of New York, have stopped collecting plastics at the curb altogether for economic and other reasons. Critics of plastics recycling argue that it is expensive, does little to achieve overall recycling goals, and that processing used plastics often costs more than virgin plastics. Some environmentalists have even argued that increasing the capture rates of

glass, paper, or yard debris can divert more resources from landfills than collecting more plastics at curbside. Collecting non-plastics is deemed a more cost-effective way, on the margin, to increase diversion rates.

While significant commercial collection systems currently exist for film plastics, film also includes a large residential component. Film plastics are the single largest plastics component in California's landfills. Due to the high collection cost and bulky nature of the material, residential film is not generally collected at curbside. Residential film plastics are highly problematic for California's curbside recycling. The best option for residential film would be sorting the film at a back-end materials recovery facility.

Plastics create several dilemmas and unanswered questions for California's IWMA waste management program. Many are confused as to the best practices for curbside plastics recycling in California, which are inconsistent. Controversy exists about appropriate goals for recycling the various types of plastics. Consumers are bewildered about plastics recycling, and government, industry, and environmentalists are in general disagreement on what to do with plastics recycling under the IWMA program. Without the major economic support of the Bottle Bill, curbside plastics recycling in California would be struggling much more.

California's IWMA waste management system currently may be able to only effectively collect #1 and #2 beverage container plastics because of the Bottle Bill program subsidy. This "one size fits all" (that is, all material types of aluminum, glass, plastics, paper, etc.) weight-based system of the IWMA does not really effectively accommodate plastics. Curbside plastics recycling in California has a tough challenge under the IWMA.

The Rigid Plastic Packaging Container Law In California Is Ineffective

The Rigid Plastic Packaging Container (RPPC) Act was originally passed in 1991. The intent of this plastics-specific law was to "spur markets for plastic materials collected for recycling by requiring manufacturers to utilize increasing amounts of post-consumer recycled material in their rigid plastic

packaging containers and to achieve high recycling rates for these plastic packaging containers."

Starting on January 1, 1995, the law required manufacturers of products packaged in RPPCs to meet one, or more, of the four compliance options for their RPPCs. These options were to: (1) use 25 percent recycled content, (2) source-reduce by 10 percent, (3) meet a product-specific recycling rate of 45 percent, or (4) be reusable or refillable at least 5 times. Further, the law exempts products such as food, cosmetics and pesticides from container compliance.

The law also required the CIWMB to annually calculate the RPPC recycling rate. For the 1995 year the overall RPPC recycling rate was calculated to be above 25 percent, so manufacturers were not required to demonstrate individual compliance with the law. However, the 1996 overall RPPC recycling rate was determined to be less than 25 percent (23.2 percent).

Starting in 1998, the CIWMB requested more than 1,500 randomly selected companies demonstrate compliance with the law for the period of 1996 through 2000. The CIWMB found that a large portion of the respondents did not package products in RPPCs, were exempted from compliance as a food, cosmetics or drug, or were not in compliance with the law. Slightly less than half of the regulated companies were in compliance.

The CIWMB sent certification forms to randomly selected firms, starting in 1998, to determine compliance with the law. It was found that a large share of the respondents were not regulated, not in compliance, or were unsure of their status. For 1996 through 1999, the CIWMB found about 10 percent compliance with the RPPC Act.

Between 1998 and 2002, the CIWMB signed compliance agreements with 150 companies not meeting the law's requirements. Compliance agreements for the RPPC law follow a basic template. A company that has executed a compliance agreement typically has six months to gear up to comply, and six months to prove compliance.

Companies must submit interim reports on compliance. A company not in compliance that does

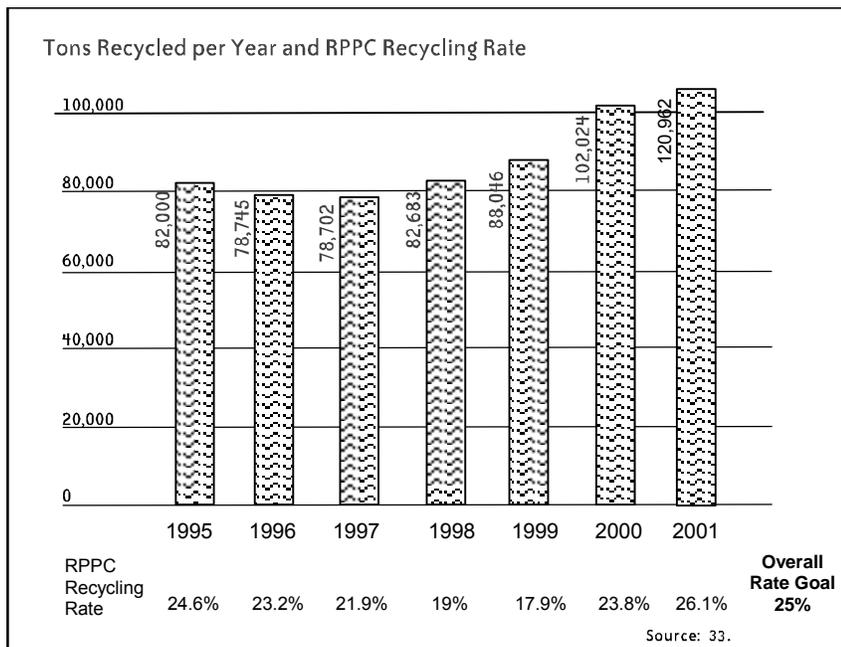
not develop a compliance agreement may be subject to a public hearing, and a fine may be imposed.

The RPPC Act plastics packaging container legislation contains some successes and some failures. The California recycling rate for RPPCs fell below 1995 levels in 2000, though total tons of RPPCs recycled has increased. In 2001, the RPPC recycling rate reached its highest level, 26.1 percent.

In 2002, the CIWMB adopted regulations requiring the use of the previous year's recycling rate for current year compliance. This is commonly referred to as the "prospective rate." Since the 2001 recycling rate was in excess of 25 percent, companies were not asked to demonstrate compliance. In May 2003,

Figure 11. California's Rigid Plastic Packaging Container Recycling Rates and Tons Recycled

The California RPPC recycling rate has declined, while total RPPC tons recycled have increased.



due to the inability to obtain necessary data to conduct a 2002 rate calculation in a timely manner and likelihood that the 2002 recycling rate would be in excess of 25 percent, the CIWMB determined not to conduct a certification for 2003. The CIWMB also determined to develop a new methodology for calculating future recycling rates and to calculate the 2002 RPPC rate for historical purposes.

The RPPC Act provides an ineffective and fragmented approach to dealing with only a small portion of California's plastic waste stream. Small firms, or those selling only a few RPPCs into California, often have a difficult time meeting requirements of this law. Larger companies tend to be in compliance with the law, but they generally claim that it stifles packaging innovation, especially

source reduction. Plastics source reduction under the law is difficult to measure and establish a baseline, and it is hard to verify source reduction within an RPPC.

The cost to the CIWMB for implementing and administering the RPPC Act is high. Since 1995, an average of six staff members have been assigned to the program, plus time expended by Board Members and staff of the legal office and executive director's office. Assuming \$70,000 in costs for each staff member, direct costs alone to the State are at least \$420,000 per year.

The costs to industry to effectively comply with the RPPC Act and document compliance are high. For an average-sized company—from the time they

receive notification from the CIWMB that they are subject to compliance, until a decision is made—costs could exceed \$100,000. This does not include costs of actually changing any company containers.

If a new injection mold is needed for compliance, the cost to a company could be substantial. Industry also spends a significant amount of money in lobbying

related to this law. During the 2000 Legislative session, industry opponents of a possible expansion of the RPPC Act spent significant time and money to lobby members of the California Legislature against expansion of the law.

Food and beverage containers are exempt from the compliance requirements of the RPPC Act.

However, interestingly enough, these same exempt containers are used to calculate the RPPC and PET statewide recycling rates under the law.

The RPPC plastics law overlaps with some plastics in the California beverage container program. For example, 67 percent of the RPPCs recycled in 2000 were CRV plastic program containers. The total tons of plastic containers recycled and reported through the California beverage container program account for more than 95 percent of the RPPC and PET plastics used in the RPPC and PET recycling rate calculations for the RPPC law.

The State of California is spending significant government and industry time and money to administer and comply with the RPPC Act. This law has produced little environmental improvements for plastics, and the law has not made any significant impact on plastics recycling rates, or markets, in the state.

The Plastics Trash Bag Law In California Is Obsolete

California's recycled-content requirement law for trash bags by manufacturers of plastic trash bags is the Plastics Trash Bag Law. The intent of this

The RPPC Act

Successes

- Some companies that might not otherwise have considered source-reducing rigid plastic packaging containers (RPPC) have considered RPPC requirements as they design future products or specify packaging.
- Six of seven surveyed companies out of compliance with the Rigid Plastic Packaging Container Act in 1996 made changes to their rigid plastic packaging under compliance agreements. They are now in compliance with the law.
- Larger manufacturers were generally able to achieve a higher level of compliance with the RPPC law.
- Most of the companies in compliance during the first round of certifications were using postconsumer resin (PCR) in their materials, at an average rate of 28.2 percent for the 253 containers using PCR.
- Approximately 40 containers were source-reduced an average of 14.5 percent.

Failures

- Plastics are not meeting the 25 percent recycling rate goal for RPPCs or the 55 percent recycling rate goal for PET. Both RPPC and PET rates fell below 1995 levels in 2000.
- The law has relatively little impact on plastics recycling and markets, especially in state. Only 20 percent of the companies surveyed for 1997–99 were located in California.
- Potentially thousands of firms are not aware that they are required to comply with the law.
- The law creates perverse incentives to switch packaging from a regulated RPPC to another material, change containers, or reduce or increase container size to avoid regulation.
- At least half of all RPPCs are exempt from the law, since they are food and cosmetic containers.
- In 1999, all RPPCs comprised a total of 1.1 percent of the waste disposed, and 12.1 percent of the plastics waste disposed.

plastics-specific trash bag law was to encourage the diversion of polyethylene from California's landfills by establishing a market for it in plastic trash bags. Legislation resulting in the Plastics Trash Bag Law, SB 951, required all trash bags 0.75 mil and greater in thickness to use 10 percent recycled-plastic

postconsumer material (RPPCM). This was later increased to 30 percent.

Chapter 44, Statutes of 1998 (Rainey, SB 698) amended certain provisions of SB 951. SB 698 eliminated the 30 percent recycled-content

The Plastics Trash Bag Law

Successes

- The use of recycled plastics in California by trash bag manufacturers for trash bags and other products has increased from 2,000 tons to more than 14,000 tons during the last decade. This has created business opportunities for a number of California manufacturers who produce trash bags and other products.
- Almost one-half of all suppliers of recycled plastics for trash bags are located in California, and 78 percent of the 6,183 tons of recycled plastics used in California trash bags comes from California suppliers.
- Among small manufacturers of trash bags sold in California, the amount of postconsumer material used has increased.
- Some manufacturers have found using recycled postconsumer film in trash bags and other products to be an economically sound business decision.
- Technological trends in the manufacturing of trash bags may lead to higher postconsumer content in trash bags. (Examples are multi-ply bags that contain postconsumer film sandwiched between virgin film, and development of new polymers resulting in the manufacture of stronger films with less material being used.)
- The volume of bags imported into the U.S. has tripled in the past five years (nearly 50 percent come from China).
- The quantity and quality of recycled resin is insufficient to raise the amount of actual postconsumer content in bags above 10 percent. Large corporations produce most trash bags for sale in California, but they generally exempt themselves from compliance from even the 10 percent requirement. This is reportedly due to unavailability or poor quality of postconsumer resins.
- Proliferation of world markets for reprocessing film and manufacturing trash bags has resulted in a decreasing supply of postconsumer resins for use in domestic trash bags. New collection systems for plastic film are now funneling the supply to secondary markets, including plastic lumber, siding, flooring, garden products, and traffic control products.
- Confusion exists regarding the legal definition of the kind of material to be used in trash bags (postindustrial versus postconsumer).
- A general shortage of postconsumer film for domestic trash bags is due to the lack of collection programs and competitive demand for the small amount collected. This is due primarily to manufacturers of plastics lumber and similar products, and to brokers who sell plastics film to foreign markets.

Failures

- The Plastics Trash Bag Law applies to only about one-fourth of the trash bags manufactured for sale in California; none of the other film products are subject to the law.
- Almost two-thirds of all bags produced according to California's minimum-content requirements are sold by California manufacturers to out-of-state users.
- Some trash bags sold in California may actually be thicker than in other parts of the United States because of the mandated need to incorporate recycled plastics. This leads to more plastic being used and disposed due to the Plastics Trash Bag Law.

requirement for trash bags and replaced it with two compliance options for bags 0.7 mil, and greater, in thickness. These two options are (1) ensuring that a manufacturer's plastic trash bags contain a quantity of RPPCM equal to at least 10 percent of the weight of the regulated bags, or (2) ensuring that at least 30 percent of the weight of material used in all of a manufacturer's plastic products intended for sale in California is RPPCM.

Plastic trash bags are made from various types of plastics, including HDPE, LDPE, LLDPE, and PET. Regulated plastic trash bags are those 0.7 mils in thickness or greater. The used material that serves as feedstock for trash bags includes dry cleaning bags, grocery store bags, mattress bags, furniture bags, irrigation tubes, and stretch wrap.

Under the law, plastic trash bags include garbage bags, composting bags, lawn and leaf bags, can-liner bags, kitchen bags, compactor bags, and recycling bags. Twenty-eight manufacturers completed certification forms in 2001; nine of these are located in California. Manufacturers identified 18 companies (suppliers) from whom they bought resin. In the same year, 39 wholesalers (26 from California) completed certification forms.

California's Plastics Trash Bag Law, though successful in some instances, has been fraught with problems and many failures. The law is currently obsolete, given the present secondary market demand for plastics film by makers of composite lumber. A major advantage of this lumber market is that it does not have the strict quality requirements of recycled-content trash bags and can thus take more polyethylene from the waste stream.

The CIWMB was required to make recommendations to the Legislature regarding the content of recycled postconsumer plastics in trash bags before October 1, 2001. The Board approved the following two recommendations at its September 2001 meeting: (1) increase the amount of RPPCM by an amount still to be determined and (2) remove the exemption from compliance for manufacturers who could not meet the RPPCM requirements, as stated by law.

At a January 2002 workshop at the CIWMB, industry raised serious concerns about these recommendations. Trash bag manufacturers, especially large companies,

were finding it impossible to meet the 10 percent standard due to inadequate quantity and quality of postconsumer film.

At the May 2002 Board meeting, CIWMB staff presented additional options for trash bags, namely, (a) increase recycled content to "x" percent, (b) eliminate the exemption, (c) provide additional compliance options such as source reduction, biodegradable trash bags, or tradable credits, (d) make no changes in the law as it now exists, (e) defer any recommendation until after completion of the plastics white paper, (f) direct the Board to work with the Department of General Services to develop a list of approved brands for sale to the State, and (g) eliminate the certification program. Staff recommended that the Board approve options (f) and (g), but the Board choose option (e).

The Plastics Trash Bag Law has a minimal impact on polyethylene diversion, which has effective markets in the domestic composite lumber and export markets. The law has shown the difficulty of attempting to micro-manage plastics markets via minimum-content requirements over a period of time.

Plastics are subject to strong market forces and international dynamics. Forcing closed-loop plastics recycling is difficult when market forces may dictate open-loop plastics recycling. Residential film plastics continue to present a challenging plastics management problem for the State, but this would be true with or without the Plastics Trash Bag Law.

Plastics Recycling Struggles Under California's Updated Bottle Bill

California's Beverage Container Recycling and Litter Reduction Act of 1986 ("Bottle Bill" or sometimes called "AB 2020") is aimed at making beverage container recycling integral to the state's economy. The primary goal of the program is to achieve, and maintain, high recycling rates for each beverage container type included in the program, thereby reducing the beverage component of litter in the state.

Redemption payment revenues are deposited in the California Beverage Container Recycling Fund. Payments are made out of the fund to consumers in the form of California Redemption Value (CRV)

when consumers return empty beverage containers to certified recycling centers. The redemption payments are 2.5 cents for each container under 24 fluid ounces, and 5.0 cents for containers of 24 fluid ounces, or greater.

In January 2000, significant changes occurred within the Bottle Bill program concerning plastics. These changes occurred with the passage of Chapter 815, Statutes of 1999 (Sher, SB 332), which added noncarbonated fruit drinks, coffee and tea drinks, noncarbonated water, and sport drinks.

In addition to adding many more plastic containers to California's bottle bill program, SB 332 for the first time applied CRV to beverages sold in all of the

seven (that is, #1 through #7) plastic resin types. SB 332 also prescribed a \$10 million public relations and advertising campaign to help implement new containers in the program.

Chapter 731, Statutes of 2000 (Sher, SB 1906) added more plastic containers to the program in January 2002. SB 1906 added noncarbonated soft drinks and vegetable juices in beverage containers of 16 ounces or less to the State's program.

Beverage containers currently covered by the California Bottle Bill program include the following beverages:

- Carbonated mineral and soda water and other similar carbonated soft drinks.

The Bottle Bill: Beverage Container Recycling Legislation

Successes

- The Bottle Bill program (sometimes called AB 2020) is widely recognized as one of the most efficient and cost-effective of all the deposit state programs, with the California redemption value half the size of most deposit states.
- Stakeholders that support the program, as well as critics, recognize that the program has a high level of public acceptance. The program has met many of its original goals, including helping with litter reduction, and it has promoted a recycling infrastructure and ethic in California.
- Californians enjoy a convenient form of container recovery, with nearly 2,000 recycling opportunities statewide. The program is also used as a funding source for various recycling and litter reduction programs throughout the state.
- California's beverage container recycling program now includes more than 17.5 billion containers, of which more than 10.5 billion were returned for recycling in 2001. The CRV of 2.5 cents that consumers pay when they purchase beverages now applies to more containers than ever before.

Failures

- A goal of the program is to achieve an 80 percent recycling rate for all aluminum, glass, plastic, and bimetal containers sold in California. In 2001, the all-materials recycling rate was 60 percent.
- The highest all-materials recycling rate achieved was 82 percent (in 1992). For the 14-year period, from 1988 through 2001, the all-materials recycling rate was 80 percent or greater during only four years: 1991, 1992, 1993, and 1995.
- The low recycling rate of 2001 is largely attributable to the addition of new beverages to the program in 2000 and 2001. However, in 1999, before the addition of new containers to the program, the all-materials recycling rate was still only 74 percent. This rate is below the original all-materials goal set more than 16 years ago.
- Beyond #2 HDPE, the recycling rates are low for the other plastic resin types, #3 PVC, #4 LDPE, #5 PP, #6 PS, and #7 Other.
- California's Bottle Bill has succeeded on some points and failed on others. The program includes an array of complex command-and-control regulations, requirements, fees, and payments that lead to seemingly endless legislative "reforms."

- Noncarbonated soft drinks, wine coolers, and distilled spirit coolers.
- Beer and malt beverages.
- Noncarbonated water and mineral water.
- Sport drinks and coffee and tea drinks.
- Vegetable juice in beverage containers 16 ounces or less.
- Carbonated and noncarbonated fruit drinks that contain any percentage of fruit juice.
- 100 percent fruit juices that are packaged in beverage containers less than 46 ounces in volume.

The law does not include any beverage container products not specifically included by the Bottle Bill, such as dairy products, wine, and liquor.

Changes made under SB 332, along with natural growth, increased the total program beverage container sales by 26 percent between 1999 and 2000. In 2002, changes attributable to SB 1906, again coupled with natural sales growth, resulted in a 6 percent increase in program container sales. These are huge increases in the number of program containers and CRV assessments. More than 75 percent of this increase is attributed to plastic containers, primarily PET plastics.

Since the two recent changes in the California Bottle Bill, sales of CRV beverage containers have continued to grow. In 2001 nearly 7 billion unredeemed program containers equaled nearly \$175 million in potential unpaid consumer funds.

In 2001, of the 17.5 billion containers sold in the program, approximately 4.6 billion—or 26 percent—were all types of plastics (of which 88 percent were PET plastics). This is both a significant number and percent of containers in the program. Plastics historically have generally not achieved their individual recycling goals.

California's Bottle Bill, as it relates to plastics, has experienced both successes and failures. The California PET beverage container recycling rate was 65 percent in 1999 (and 36 percent in 2001). The highest PET beverage container recycling rate was 71 percent in 1994.

PET beverage container recovery in California has grown tremendously over the past few years. In 2001 approximately 1.4 billion PET beverage containers were recycled in the state. In 1998, four years earlier, only approximately 0.7 billion PET beverage containers were recycled in California. The number of California PET beverage containers recycled has thus doubled in the last four years. The number of PET beverage containers sold in California during the same four-year period increased more than three times, from approximately 1.3 billion PET containers sold in 1998 to approximately 4.0 billion PET containers sold in 2001.

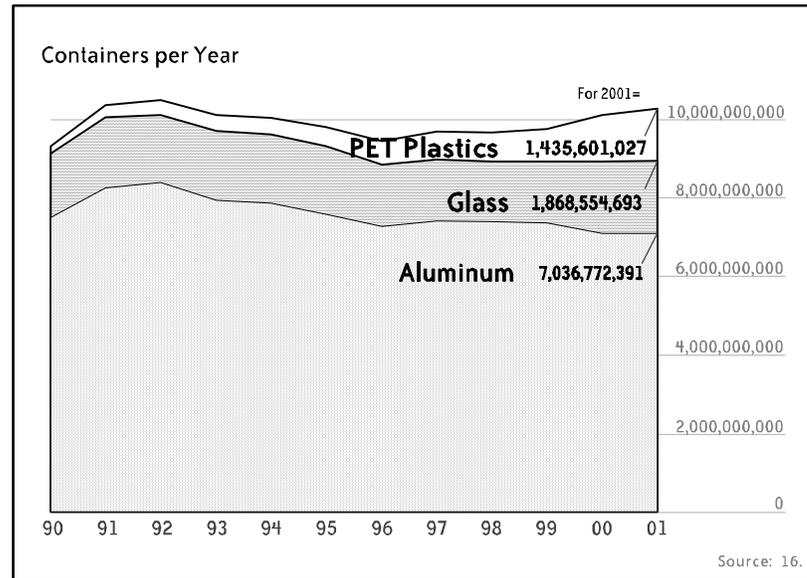
PET beverage containers recycled in the state can be viewed as both a success story and a continuing challenge for the California Bottle Bill program. PET container recycling is a success because of the large absolute numbers of PET beverage containers that are recycled, largely due to the success of the Bottle Bill recycling infrastructure.

However, PET containers remain a large recycling rate challenge for the Bottle Bill program because of the large and growing volume of PET containers sold in the state and not recovered. The denominator (or containers sold) in the state's PET beverage container recycling rate continues to outgrow the numerator (or containers recycled). Part of the reason for the large growth in PET beverage containers sold in the state is due to the demand for single-service PET containers, which increased after 1994. Another reason for this growth was the addition of new beverage containers to the program.

The number of PET beverage containers recycled in the state is expected to continue to grow. However, the PET beverage container recycling rate will probably not increase much without further refinements to the Bottle Bill program and other changes to California's plastics policies.

The California Bottle Bill is unique among the states that have a beverage container return system because in the other deposit bottle states, the cans and bottles are returned to stores from which the containers were purchased. In California, redemption material is collected and redeemed by participant type, including certified recycling centers and reverse vending machines; curbside programs; and

Figure 12. Total Beverage Containers by Percentage Recycled Per Year Under the California Bottle Bill, 1990–2001



collection, drop-off, and community service programs. Most Bottle Bill material types are redeemed at recycling centers, except for #2 HDPE plastics. The #2 plastics are a larger percentage (65 percent); these are collected through curbside programs.

Bottle Bill materials that are light and easy to handle, such as aluminum, and that have both scrap value and CRV value, are primarily brought to redemption centers where consumers receive CRV and scrap value payments. Material that is heavier, or less easy to handle, such as glass, #1 PET plastics and #2 HDPE plastics, will have a larger component collected by donation programs. These include curbside programs, collection and drop-off programs, and community service programs. Still, 67 percent of #1 PET plastic program containers, and 25 percent of #2 HDPE plastic program containers, are collected at redemption centers.

The CRV for plastic program containers #3 through #7 are currently returned exclusively through redemption centers. This is possibly because curbside and donation programs have decided not to separate these types of plastics for redemption, so that redemption centers are the only possible avenue to redeem and separate the non- #1 and non- #2 plastic program container types. No curbside commingled rate is available for #3 through #7

plastic beverage containers, so curbside operators can only claim these plastic beverage container types if they are sorted.

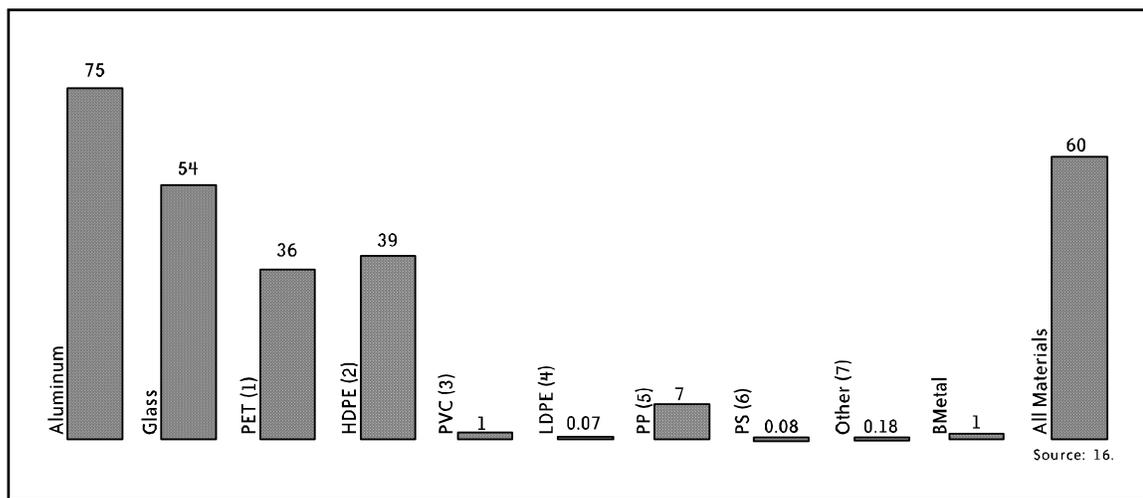
Traditionally, aluminum has always garnered the largest market share, per sales volume, compared to other material types. The all-material beverage container recycling rate generally follows the same trend as aluminum. Very little market share exists for material types in the Bottle Bill program other than aluminum, glass, and #1 PET plastics. The glass market share in the program has remained fairly static in recent years.

However, in the past two years, since inclusion of the new beverages and new plastic container types into the program, the aluminum market share has dropped, and #1 PET plastics have experienced a gain. The result of this program shift is that the high recycling rate of aluminum now has a reduced impact on the overall California Bottle Bill program recycling rate, and the lower recycling rate of #1 PET plastics now has a greater impact. Largely due to PET plastics, achieving the all-materials recycling rate goal under the Bottle Bill will be even harder in the future.

In January 2000, the new beverages added to the program brought new containers. These included #2 HDPE, #3 LDPE, #5 PP, #6 PS, and #7 Other plastics. The #2 HDPE plastics already had an

Figure 13. California Recycling Rates for Beverage Containers, 2001

Non-PET and non-HDPE plastic beverage container recycling rates were minimal in 2001.



established market, and they were being collected by most curbside programs for which they received scrap payments only. Adding HDPE to the program did not require extensive adjustments to be collected. The material had a program recycling rate of 22 percent in 2000, which increased to 38 percent in 2001. The California recycling rates for non-PET, and non-HDPE, plastic beverage containers were minimal in 2001.

Adding plastics #3 through #7 to the California Bottle Bill program has created significant unresolved issues for the program. These plastics were not typically collected previously, so they have limited established markets. These non-#1 and non-#2 plastic resin types are sold in limited volumes, and each have less than 1 percent market share of program beverage containers. Even if 100 percent of the #3 through #7 plastic beverage containers sold were redeemed in 2001, this would only raise the all-material recycling rate by 1 percent.

SB 332 and SB 1906 added plastic containers with limited markets to the Bottle Bill program, though these containers are a very small percentage of the total beverage container program. These two pieces of legislation, however, added a tremendous number of PET plastic containers to the Bottle Bill program.

The container addition to the Bottle Bill program has created concerns by some curbside programs regarding redemption by separate plastic resins. The DOC is reviewing the segregated and commingled

rate structures to better accommodate the new plastic resin types. Currently there is a commingled (CRV + Non-CRV) payment rate for PET plastics and for HDPE plastics. There is no commingled rate for #3 through #7 plastics. There is only a CRV rate for these plastics, and this creates a particular problem for the curbside recyclers who must sort these containers in order to redeem them.

The DOC is reviewing a commingled rate for #2 through #7 plastics so that curbside operators would be encouraged to redeem this plastic material. This DOC action would help recyclers, but some end users of HDPE are concerned that it will also adversely impact the quality of redeemed plastics material.

The Bottle Bill is a complex program covering approximately 3 percent of California's waste stream. Consumers are confused about the new types of beverage containers added to the Bottle Bill program and about how the Bottle Bill overlaps, or not, with the State's RPPC program.

For example, HDPE milk jugs are not included in the Bottle Bill program. Some plastic juice containers that are #6 PS plastics and have sealed foil lids that are not recloseable (making it a beverage container) are new to the Bottle Bill program. However, plastic clamshells (also #6 plastics, but expanded polystyrene (EPS), have a recloseable lid, making them an RPPC.

Finally, common “Styrofoam” coffee cups (EPS) are outside the boundaries of both the DOC-administered Bottle Bill and the RPPC program of the CIWMB. This parceling of plastics containers is confusing to professionals working in the area, and even more so to consumers. The separation defies both common sense and practicality.

While long-term structural plastics issues have not changed materially in California in the last 20 years, significant change has occurred in plastics with expansion of California’s Bottle Bill program. Some of the changes to the Bottle Bill are still emerging. Whether the beverage container program can accommodate the tremendous influx of PET plastic containers in terms of recycling rates is unknown at this time.

Plastics create several dilemmas and unanswered questions for California’s Bottle Bill. Can the Bottle Bill now meet its overall recycling goal with the now larger percentage of plastics? Should all redemption centers be required to take back all types of plastic beverage containers? Should the State really be collecting #3 through #7 plastics through this program at all? Should conversion technologies help provide the needed “market” for under-utilized #3 through #7 plastic resins?

Should the CRV rate be higher, or different, for plastics? Does the State need material-specific funds so that plastics would have their own earmarked, unredeemed CRV fund, instead of the present common central DOC fund?

Is industry paying its fair share plastics processing fee if manufacturers are to internalize the cost of recycling their containers? Because in relative terms the plastics scrap value is low, the plastics processing fee is essentially the cost of recycling. Do we need a new, much higher processing fee for each plastics type #3 through #7, instead of the current single plastics processing fee?

Prior to 2002, beverage manufacturers paid the processing fee based on the number of containers recycled, not sold. The processing fee is now to be paid on the much larger number sold. Will industry actually pay much higher plastic processing fees for different plastic resin types?

Some of these policy issues may be resolved by current legislation and upcoming DOC actions. The DOC will be doing a cost-to-recycle study for each plastic resin type in early 2003. The calculated costs to recycle these new plastic resin types are expected to be quite high.

The forthcoming new processing fee for each plastic resin will be implemented in January 2004, along with any new legislation that increases the processing fee for containers with lower recycling rates. This could have a major impact on the viability of putting beverages in containers other than PET and HDPE plastics. Will industry pay a potentially very high processing fee for plastic resin types #3 through #7 to guarantee that each container “pays its own way”?

Some argue that the California Bottle Bill program is in a transitive state. With new plastic processing fees forthcoming in 2004, redemption centers may get fairly compensated once the Bottle Bill program is fully operational. Many program participants argue against making any further changes to the Bottle Bill until the real impacts of SB 332 can be ascertained. These upcoming actions should improve plastics recycling within the program. But whether the Bottle Bill system can effectively accommodate all kinds of plastics is still unknown.

California’s Bottle Bill may only be able to effectively take back #1 and #2 plastic program containers. Does the one-size-fits-all approach (that is, all material types) of the Bottle Bill now fit plastics, and all subcategories of plastics? California’s Bottle Bill has a tough challenge concerning plastic beverage containers.

Plastics Issues Have Not Been Adequately Addressed in California

Of the four major California laws governing plastics, none come close to effectively managing the state’s plastic issues. Even additional focused improvements to the State’s existing laws may not be enough to overcome the unique long-term challenges of plastics recycling.

Two of the State laws, the IWMA and the Bottle Bill, cover multi-material types beyond plastics. The other two, the RPPC Act and the Plastics Trash Bag Law, focus on a narrow segment of plastics. Both

sets of State laws have little future potential for managing the broad and complex range of plastic issues that the State presently faces.

The two diverse multi-material (including plastics) State laws, the IWMA and the Bottle Bill, struggle to adapt to the unique and heterogeneous attributes of plastics. These two laws, the most extensive and significant of the four, have had much greater success with the other more homogeneous, non-plastic material types. For these two State laws, “one size does not fit all” for plastics and for the different types and applications of plastics within the general plastics material grouping. While the Bottle Bill has had some success in PET plastics beverage container recycling, this is only one segment of overall plastics use.

The other two specialized State plastics laws, the RPPC Act and the Plastics Trash Bag Law, are much too narrowly focused on only a sliver of plastic types and issues. These two laws also have proven themselves inflexible to adapt to rapidly changing plastics technologies and market conditions.

All four of the California laws are fractionalized, or piecemeal in their own way with regard to plastics, even considering the two multi-material laws. At best, all these laws only try to address a small portion of the overall plastics management challenge. The RPPC Act and the Plastics Trash Bag Law essentially became ineffective and obsolete upon their final implementation.

The four State plastics laws may be piecemeal, ineffective, and short-term focused. But all major plastics stakeholders (government, industry, and environmentalists) show subtle reluctance to overly scrutinize these laws, give them up entirely, or even temporarily suspend them. Pragmatic stakeholders favor the ineffective status quo State laws and institutions concerning plastics.

For government, each of these laws is now a known institution with its own inertia and institutional infrastructure. Sometimes the “known” is more comfortable than the unknown; some management and staff have become vested in these programs. Many companies have already adapted to these regulatory laws. Industry is reluctant to overly criticize them, fearing much more onerous plastics laws. And environmentalists who have fought hard

over many years to enact plastics laws are also reluctant to give up these “positions” without proven better replacements.

All of the major plastics stakeholder groups usually often see only a relatively small portion of the overall statewide plastics issues (for example, one plastics law application or one plastics container or resin type). Until now, very few of the stakeholders have examined the totality, and cumulative impacts, of combined plastics waste management issues.

The major inadequacies in California’s plastics management and regulatory system will be highly challenging to address and change. A reassessment of the role and effectiveness of each of California’s four major plastics laws is necessary to reach the larger goal of optimizing plastics use, recycling, and disposal in California.

The current management and regulatory system for plastics in California is unable to address the magnitude of the state’s cumulative plastics issues. The state needs new, realistic, and better alternatives to the current plastics management and regulatory system.

The Continuing Debate Over All-Bottle Plastics Curbside Recycling in California

According to the American Plastics Council (APC), a trade organization for large plastic manufacturers, 95 percent of narrow-necked plastic bottles are made from #1 or #2 plastics. The APC states that by asking communities to concentrate on just bottles, consumers will be recycling more of the most valuable plastics.

The APC wants more communities to go to the “all-bottle” method because it is simpler, and they argue that more #1 and #2 plastic bottles are collected through this system. The APC argues that the simplified message “recycle all your plastic bottles” significantly increases collection of postconsumer plastic bottles. The Association of Post-Consumer Plastic Recyclers (APR), the National Association for PET Container Resources (NAPCOR), and the National Soft Drink Association (NSDA) have supported this all-bottle program promoted by the APC.

In spite of the above APC policy, recycling coordinators in some California jurisdictions have

been reluctant to adopt programs to collect all plastic bottles. Local government recyclers have cited concerns with potential for increased contamination (especially PVC plastics and residue disposal), increased costs of curbside collection and sorting (including mixed-color HDPE), and overall reduced plastics material marketability.

Critics of the all-bottle collection program argue that the APC initiative will not increase recovery of #1 and #2 plastics any more than would other reinvigorated consumer education efforts. Another criticism of the all-bottle program: it creates the perception that #3 to #7 plastic bottles are finally being recycled, when in most cases they are not recycled.

What Should the State Do About Plastics?

While progress has been made in recycling and conservation of the state's plastics, there are unaddressed problems related to plastics use, recycling, and disposal. Existing California policies are not successfully addressing the State's plastics issues.

Plastics are really a victim of their own achievements. Plastics are garnering attention because they have successfully displaced other materials in a broad range of products and packaging. However, plastics also have displaced other materials in California's landfills and environment.

The State needs to re-evaluate existing plastics management, build on those policies that are working, and replace those that are ineffective with new and smart policies. California, along with the United States, is already behind much of the rest of the world in trying to manage plastics and packaging waste. However, plastics policies applied in other parts of the world have their own specific flaws.

Many of these policies are not appropriate for California.

Today, California has the opportunity to lead the nation in plastics management. The State can provide a collaborative process for all interested stakeholders to identify and implement new and unique California-specific solutions to the challenges in plastics. These challenges include promoting plastics resource conservation, increasing plastics recycling, and increasing the use of recycled plastics.

A Fresh Approach Is Needed for Managing Plastics in the State

No single answer, policy, or program will achieve all California plastics policy goals. Some plastics can and should be recycled, and some plastics should not be recycled. Some plastic products can and should contain recycled content, and some plastics should not. Some plastic products should be biodegradable, some should not; some plastics waste should be converted to fuel, some should not. Some plastics are managed appropriately today; most are not.

Figure 14. Current State Plastics Model

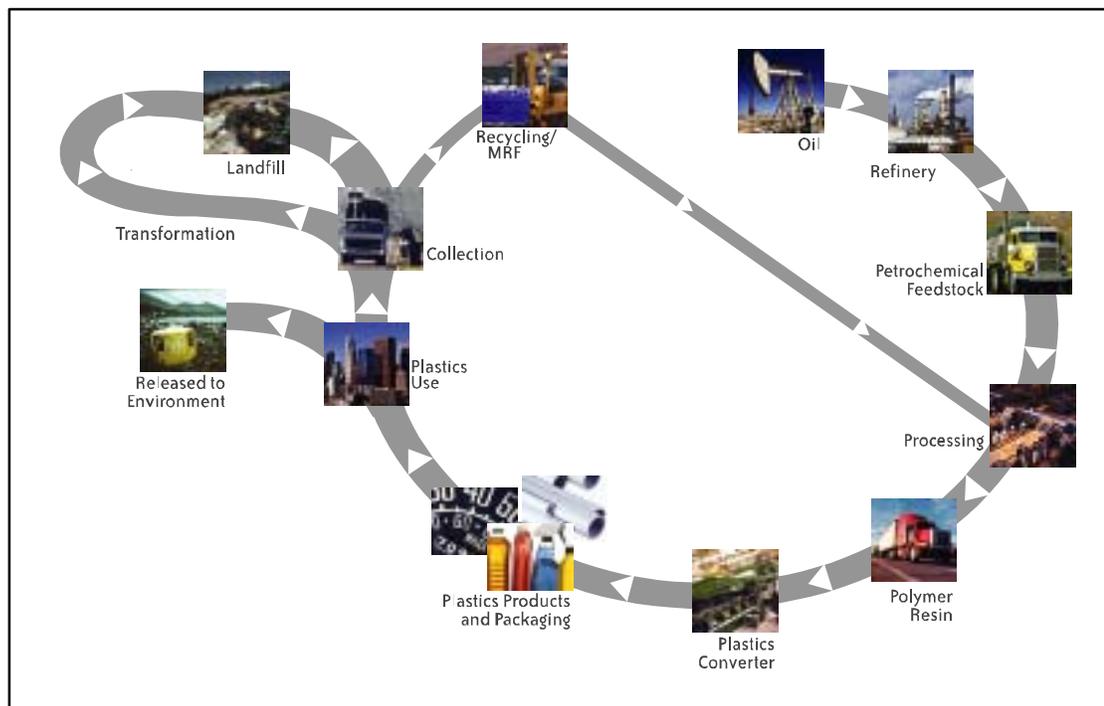
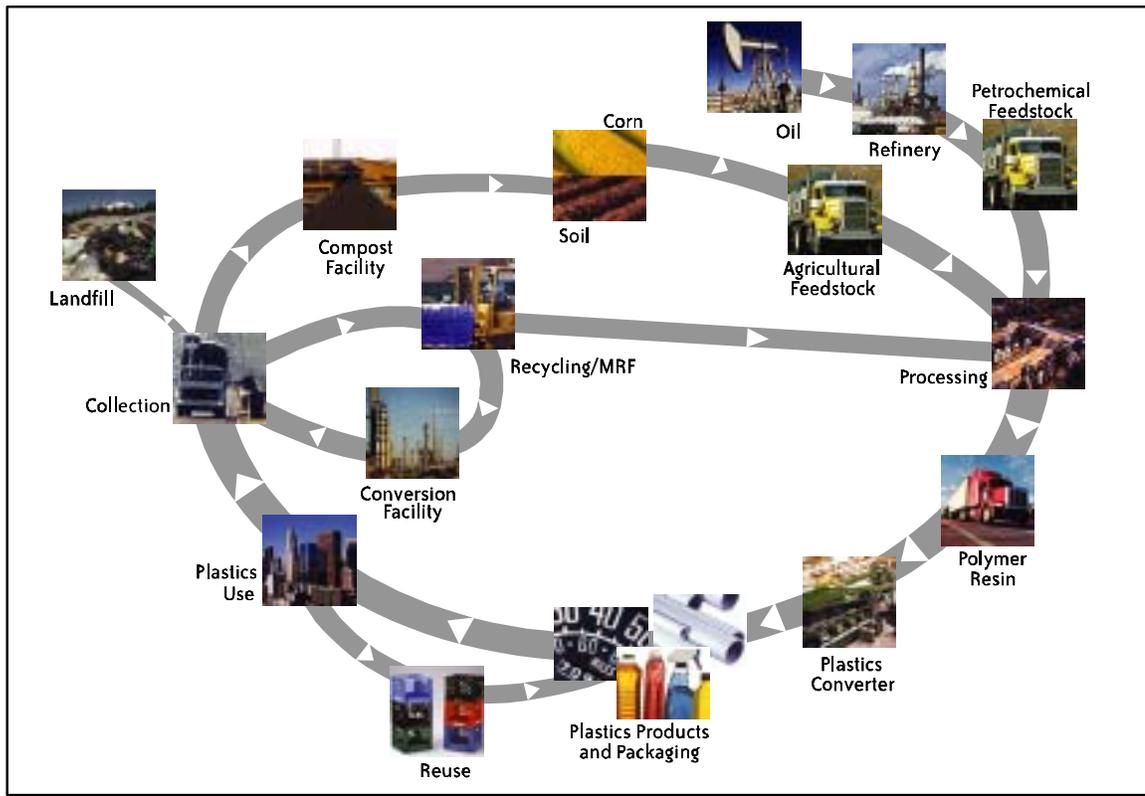


Figure 15. Future State Plastics Model



The State’s current plastics management model is to landfill most plastics and recycle others. Some plastics are released to the environment. A future plastics model would have an optimal mix of management alternatives for plastics, including reuse, recycling, composting, and conversion. In addition, many other currently unknown technological alternatives will be developed in the future to supplement this plastics management mix. The challenge for California is to develop and implement a range of flexible policies and programs that will allow environmentally sound, technologically appropriate, and economically efficient solutions to rise to the top for each plastics type and application.

Certain State Plastics Policy Issues Need to Be Explicitly Considered Up Front

Before considering which plastics policies to implement, stakeholders need to establish goals for plastics in California. Several broad plastics policy goals have been proposed.

Plastics goals should acknowledge a need to embrace plastics for their positive benefits to society and the economy at large. At the same time, the goals need to stress better management of this material to address the environmental and economic externalities generated as plastics use becomes more and more widespread.

Plastics recycling and increased collection goals should be promoted when technically and economically feasible, but not to the exclusion of other management goals. Plastics recycling alone will not solve California’s plastics management issues.

Solving problems arising from increased use and disposal of plastics will require all involved parties to work together to identify and implement a broad range of solutions. If plastics management issues are not addressed now, they will only get worse later. Stakeholders must work together to address solutions for managing the increased use of plastics in the state.

Plastics Policy Goals and Objectives

Issues	Goals
<ol style="list-style-type: none"> 1. Plastics are here to stay in modern life since they are integral to our lifestyle and economy. They have societal benefits due to their light weight and versatile range of applications. 2. Significant economic externalities are present in the phases of plastics production, use, recycling, and disposal. These include litter, marine ecosystem impacts, chemical emissions, and known/unknown health risks. 3. Plastics production continues to far outpace plastics recycling, and it is displacing other more recyclable materials. As a result, plastics in the municipal solid waste discard continue to grow rapidly. Plastics are the fastest growing portion of the MSW waste stream. 4. Plastics represent a disproportionate share of landfill space. Next to paper, plastics is the second-largest overall category of waste volume going into municipal landfills. 5. The plastics recycling rate has stagnated at a low level, and plastics recycling quantities and rates remain lower than other materials such as steel, aluminum, glass, and paper. 	<ol style="list-style-type: none"> 1. Do not eliminate plastics. Instead, develop management systems to optimize plastics use, recycling, and disposal while benefiting from the positives of plastics and minimizing their negatives. 2. Develop policy options that internalize the economic and environmental externalities associated with plastics. The policies need to stress equitable sharing of these costs between all involved parties. <ol style="list-style-type: none"> a. Develop funding mechanisms to support internalization of plastic externalities. This funding could be used for: <ul style="list-style-type: none"> ● Preventing and cleaning up marine and land-based plastics litter. ● Plastics resource conservation education. ● Efficient plastics collection and recycling. ● Acceptable plastics disposal. b. Minimize the use of hazardous, or potentially hazardous, additives in plastics. c. Conduct research on the impacts of various plastics on health and the environment, and seek to reduce the harmful impacts of plastics. Where the application of specific plastics pose a clear public health and/or environmental threat, those applications should be prohibited without the action being perceived as a challenge to plastics in general. d. Minimize improper discarding of plastics by providing adequate receptacles and locations for discarding or recycling plastics. 3. Promote plastics resource conservation and minimize the unnecessary use of plastics. Minimize plastics growth in the waste stream through source reduction, reuse, recycling, and conversion options that are environmentally sound and technically and economically feasible. Work to ensure that existing landfill systems can handle increasing levels of plastics. 4. N/A 5. Identify reasonable recycling targets for plastics, some equal to other material types and some lesser. Promote technological innovations in plastics recycling where economically and technically feasible. Where these innovations are not feasible, promote plastics with reduced environmental impacts, such as biodegradable plastics. Promote technological innovations such as conversion technologies for less-recyclable plastics.

Continued on next page

Policy objectives of this plastics white paper include: (1) promoting plastics resource conservation, (2) increasing the use of recycled plastics, and (3)

increasing the plastics recycling rate. These three objectives are all reasonable, but as is so often the case, the “devil is in the details.”

Plastics Policy Goals and Objectives, continued

Issues	Goals
6. Plastics bottle-to-bottle recycling historically has been miniscule compared to other secondary material closed-loop recycling.	6. Encourage bottle-to-bottle recycling where technologically and economically feasible (for example: Coke, Pepsi, HDPE containers). Do not mandate closed-loop recycling when other open-loop options are also feasible. Develop policies that promote or allow for either type of recycling.
7. Plastics historically have been uneconomical to recycle without subsidies (average collection and processing costs exceed scrap values by more than two and one-half times). Plastics are generally not as economic to recycle as other material types, and plastics recycling costs could rise further due to the proliferation of plastic containers. Higher plastics recycling rates come at an extremely high cost, higher than that for other material types.	7. Promote and support innovations in plastics product and packaging design geared for recycling and for the economical collection of clean plastic streams. Support incentives that encourage manufacturers to minimize the use of additives, which increase contamination and reduce the quality of recovered plastics material. Develop and disseminate best practices in collection and processing systems to further support the economical collection of clean plastic streams. Develop and promote plastics collection and processing quality standards. Equitably spread the cost of recycling plastics among all responsible parties. Do not subsidize plastics recycling costs in a way that would create disincentives to collection and processing efficiencies.
8. Plastics are global commodities, subject to the volatility of world economic forces.	8. Allow flexibility in plastics policies and programs to accommodate changes in global economic conditions and new developments in plastics recycling and production. Consider the impact of potential new forthcoming California plastics policies within the context of a global plastics economy.
9. Plastics management issues have not changed materially in the last 20 years. Optimizing plastics use, recycling, and disposal in California will require a significant shift in public policies.	9. Develop a long-term comprehensive approach to resolving plastics issues in California. This approach should reflect product stewardship/shared responsibility principles and the unique characteristics of plastics as compared to other materials. Use a collaborative process with State and local government, industry, consumers, and environmentalists.
10. Fundamental plastics issues are by their very nature subtle, long-term, unmet social infrastructure challenges that have not been effectively addressed. This is partially because they do not pose the dramatic environmental short-term hazards of automobile tires, waste oil, batteries, or hazardous waste. Nonetheless, plastics need to be addressed before they create a crisis.	10. Work with all interested parties to better understand and accept the long-term benefits and problems associated with plastics. Agree to develop long-term policy options that take these characteristics into account. Promote and support clear, honest, and relevant information about plastics use, recycling, disposal, and its positive and negative impacts. Prevent future potential problems related to plastics, rather than waiting to resolve them after they occur.

What plastics should be recycled? What quantity of plastics should be recycled and at what cost? What “counts” as plastics recycling? Who should pay for plastics recycling? What products should be manufactured using more recycled plastics? If products are manufactured out of state, what is the impact on California’s plastics markets? How do we balance and measure plastics source reduction and recycling goals? What is resource conservation as it applies to plastics? Do we use mandates or incentives to achieve plastic goals? What should the

criteria for evaluating plastics policies be?

Examining each of these plastics policy questions in more detail can help illuminate potential plastics policy directions for California.

What Plastics Should Be Recycled?

Not all plastics should be recycled. Many plastic materials are of insufficient quantity or quality to warrant establishment of collection programs, processing, and marketing. The following are currently recycled to some extent in California:

- Beverage containers.
- Other rigid containers such as milk jugs and non-beverage PET bottles.
- Film from commercial and some agricultural sources.
- Battery casings.
- EPS packaging peanuts.
- Transport packaging.
- Some durable goods.

Most other plastics are not recycled.

Future policies could include recycling for other plastic types, such as shredder waste from automobiles and more extensive electronics recycling. Some new technologies can now potentially allow recycling mixed plastics into useable products. Because plastics technologies and markets are in continuous flux, over-dictating plastics recycling is not recommended. Incentives that promote plastics recycling—or that promote the conditions to make plastics recycling profitable—are preferable to mandates to recycle certain plastic materials.

Why should some plastics be recycled? Some argue that the economics of plastics recycling cannot be rationalized until the State prioritizes its goals. The State must determine whether the primary goal of plastics recycling is to reduce landfill waste, or to encourage the reuse of packaging.

Although plastics in landfills are increasing at a rapid rate, plastics recycling does not contribute significantly to meeting overall State waste diversion goals. Plastic recycled-content laws have been only moderately successful, and the laws have relatively little impact on plastic recycling rates in California.

Some plastics are recycled to meet broader resource conservation goals, particularly efficient use of materials and energy. Recycling, saving energy and resources, and maintaining the resin in the economic system are effective management alternatives for some plastic products and packages. These alternatives are preferable to permanently landfilling the material. The goal of plastics recycling should be

optimizing use of the material, which is a much broader goal.

How Much Plastic Should Be Recycled, and At What Cost?

Establishing a single plastics recycling rate for California is not useful. Instead, the market should determine how much plastic, and which type, is recycled. This would be possible with policy support and incentives.

The recycling rate for plastics is likely to be lower than for other non-plastic material types in many cases. This is not inherently bad when considering the general source reduction benefits of plastics, as well as the high economic costs of recycling plastics. In the 1997 report *Solid Waste Management at the Crossroads*, Franklin and Associates posed a recycling rate of 7 percent for all plastics by 2000 and 10 percent by 2010. The 1999 rate, nationwide, was just below 6 percent.

The California beverage redemption program has a beverage container recycling goal of 80 percent and additional provisions for any one type of container that falls below 65 percent. PET plastics have exceeded this individual-container provision in previous years, and could probably do so again over time, once recycling catches up to the new containers. A 65 percent recycling rate is a stretch, but it is probably achievable for HDPE beverage containers and even for HDPE milk jugs, which are not part of the beverage program. However, a 65 percent recycling rate is not realistic for #3 through #7 plastic containers, since the supply of containers and collection programs in these resin categories is insufficient.

Rigid plastic packaging has a 25 percent recycling rate goal, which could probably be met through beverage container recycling alone, if the beverage container recycling goal were met for PET and HDPE. Through industry-funded return programs, expanded polystyrene (EPS) packaging peanuts are currently recycled at a rate of about 50 percent and reused at a rate of about 30 percent nationally.

Economically, increasing recycling rates for those plastic containers and materials with a recycling infrastructure in place makes sense. This is preferable to expending effort on new collection systems for small-volume plastic containers.

The types of plastic products available to recycle are always changing. If new markets for recycling develop—such as the film markets for composite lumber—these markets and recycling of these materials should be encouraged and promoted. Part of any forthcoming collaborative plastics effort between industry and government should be to establish realistic recycling rate goals for different plastic types.

What Counts As Plastics Recycling?

Many new plastics management alternatives are now being developed that are not traditional recycling, but they could potentially divert plastic materials from landfills. These alternative management options should “count” as recycling and be promoted and encouraged after traditional recycling. Once those plastic materials that can be effectively recycled have been pulled from the waste stream, other alternatives besides landfilling should be promoted.

Composting of biodegradable plastics is one such alternative. Biodegradable plastics are becoming available and are nearing broader commercial market breakthroughs. Two particularly promising areas are biodegradable food containers (replacing PS) and biodegradable film for bags, particularly yard waste bags. Both of these biodegradable plastic applications are appropriate for composting, assuming the existence of cost-effective composting facilities.

A number of issues relate to more widespread use of biodegradable plastics. For example, how would workers sort biodegradable plastics from recyclable plastics on a sort line? Also, with a noticeable absence of municipal solid waste composting facilities in California, biodegradable plastics would need to be collected through special programs.

At this time, discrete biodegradable plastic and composting applications are worth encouraging. Two examples are: 1) food service, where the biodegradable plastic containers could be collected for a food composting program; and 2) bags for yard waste, where they could be composted with their contents in yard waste composting facilities.

Potential conversion technologies that reduce plastic resins to fuel products could also keep non-recyclable plastics from the landfill. Removing these plastics from the end of the materials recovery

facility sort line—after sorting more recyclable plastic materials—is preferable to landfill plastics disposal.

Who Should Pay for Plastics Recycling?

In some cases, the cost of recycling plastics exceeds the scrap price recyclers receive. The California beverage container program provides a safety net—the processing fee—to cover costs of beverage container recycling. In some cases, such as film recycling programs for composite lumber, recycling is economically feasible since the end user is willing to pay enough for the material to cover the recycler’s costs. For other plastic products and container types, recycling is not economically feasible.

The benefits that accrue from recycling—resource conservation, energy savings, reduced emissions, jobs, etc.—accrue broadly to society. But no one entity is interested in bearing the costs, which can be significant to an individual recycler. Broader sharing of plastic recycling costs—not placing the full amount on local governments or consumers—would be preferred. The plastics industry may be willing to provide additional support for plastics recycling at the collection level, as it has been doing under the Bottle Bill for more than twelve years. Some individualized collection programs have also provided additional support for plastics recycling.

What Products Should Use More Recycled Plastics?

Rather than dictating recycled-content levels in certain products, the State should provide incentives to encourage recycled content in a range of closed- and open-loop products. Technologies and markets are changing too rapidly for recycled-content mandates to keep up; the California Plastics Trash Bag Law is a prime example. However, some incentives should be available to use recycled content to help promote and encourage existing and new plastics markets.

Considerations for Promoting Plastics Source Reduction

One of the factors discussed frequently when considering diversion policies is that industry does not need additional mandates to promote source reduction. The market’s economic incentives to source-reduce are apparently strong enough to promote source reduction, although marketing or

other interests sometimes result in more packaging or product than necessary. Current waste management policies cannot effectively measure and promote source reduction, nor can they appropriately reward or credit source reduction efforts.

A collaborative industry task force may want to consider developing and promoting source reduction through metrics such as waste intensity and resource productivity. Waste intensity is the ratio of the amount of waste generated per unit of production or service output, such as packaging-to-product ratios. Resource productivity is the ratio of production or service output per material input; for example, the amount of heat conservation provided per pound of insulation. Both of these measures could be used to help reward and promote source reduction, perhaps through industry reports on plastic source reduction efforts.

If Products Are Manufactured Out of State, What Is the Impact on California's Plastics Markets?

One of the ironies of California's plastic laws is that, while they may have relatively little impact on plastics markets and products in California, they do have an impact at the national level. This helps keep California at the forefront of recycling policy. However, if the goal is to increase the use of plastics recycled in California, the policy is not very effective.

Here are two possible approaches to address this issue: expand this California dialogue on plastics policies to the national level; or, identify and implement policies that will emphasize, to the maximum extent possible, California plastics markets. California policymakers should consider whether a combination of approaches is appropriate.

How Does the State Balance and Measure Plastics Source Reduction and Recycling Goals?

Source reduction is at the top of the conventional waste management hierarchy. It is also the most difficult option to measure, and thus to recognize. As a result, this preferred option often is given lower priority or emphasis than recycling and composting. Recycling and composting are much easier to monitor and measure. Plastics, which are almost always source-reduced over other material types, are the main losers in this dilemma.

In some cases, efforts to quantify or encourage source reduction actually discourage it. For example, the California RPPC Act creates disincentives to source-reduce plastic containers when they are introduced. Plastics should be appropriately recognized for their source reduction benefits. Use of new monitoring measures, such as resource conservation or waste intensity measures, could help address this issue. Checklists or company action plans could also validate source reduction efforts.

What Is Resource Conservation As It Applies to Plastics?

Resource conservation cannot be fairly examined through isolation of a single material type, such as plastics. Large substitution or displacement effects impact overall resource conservation, and other materials displacement needs to be considered.

Below are six general goals for resource conservation as they apply to plastics and other materials in products and packaging:

- Use less material, especially fewer raw materials.
- Use less hazardous, toxic, or potentially toxic materials.
- Reduce materials entering the environment (including landfills).
- Make products last longer.
- Make packaging last longer.
- Reuse more material.
- Recycle, compost, and convert more material.

When considering whether a plastics product, package, or material is achieving resource conservation goals, all of these aspects of resource conservation should be considered. Policies should promote the appropriate balance for that plastics material, product, or package.

Should Government Use Mandates or Incentives to Achieve Plastic Goals?

A number of potential public policy tools can fit between the two extremes of a *laissez-faire* market approach and command-and-control product or material bans and take-back mandates. Strict mandates have several problems: they are difficult to implement, costly for both industry and government,

and they are often relatively ineffective in meeting their policy goals. However, with some exceptions, the plastics industry is generally not adequately addressing plastics problems on its own.

Some costs associated with plastics production, use, and disposal are not borne by those who produce the material, or those who use the material. Plastics policies must address these plastics economic externalities if they are to effectively solve plastics problems. Voluntary programs and incentives are generally preferable to mandates, and they will likely be more effective in meeting policy goals.

However, if plastics stakeholders are not willing to contribute to and work together towards developing long-term plastics solutions, some mandates could ultimately be necessary to achieve some plastics policy goals.

Should Certain Plastic Products or Packaging Be Banned?

Bans on the sale of plastic products are sometimes proposed as a means to solve plastics issues. Two potential plastic bans are most often mentioned: PVC containers and polystyrene (PS) food service containers. The first are a contaminant in PET recycling; the second are not currently recycled due to economics and are a major component of litter in storm drains.

While bans may help solve immediate problems, they are generally not an effective long-term solution. Banning PVC containers would help reduce the cost of PET recycling and contamination from PVC. However, a new container type may soon be developed that may also create contamination problems.

A more effective solution than banning PVC containers might be to pass on the extra costs of recycling PVC containers (or other containers with higher costs) in a processing fee (as expected in 2004 under the Bottle Bill). Similarly, banning PS food service containers would reduce the amount of PS entering storm drains. However, PS containers would be replaced by some other container type that may lead to other problems or negative impacts.

Encouraging and promoting alternatives such as biodegradable food service containers used in

conjunction with food composting—and extensive litter reduction efforts—could be more effective than bans in solving problems posed by plastic materials. Bans are narrow in scope, addressing a very specific problem with a very specific solution. This narrow-focused approach is an ineffective means to address a material with such global applications and ramifications as plastics. Bans should only be used by policy makers as a last resort.

What Should Be the Criteria for Evaluating Plastic Policies?

Once stakeholders agree on goals for plastic policies, they must identify criteria to evaluate the proposed policies. No single policy can maximize these criteria simultaneously. Policymakers must make trade-offs between criteria, maximizing all of them to the extent possible.

For example, a plastics policy that is more complicated and difficult to administer could provide better flexibility and broader applicability. To the maximum extent possible, plastics policies and programs should strive for the following:

- Shared responsibility between industry, consumers, and government, leading to a more equitable distribution of responsibility for the full environmental and economic consequences of a plastics product or package.
- Broad applicability, as opposed to plastic resin, or specific plastic product policies. This must be balanced by the need to accommodate unique specific resin characteristics, while avoiding overly specific or prescriptive plastics policies.
- Creating incentives for the “right” plastic actions (that is, meeting plastics policy goals) while minimizing unintended consequences.
- Flexibility, allowing for plastic technologies and markets to rapidly change.
- Compatibility with current and future waste management systems.
- Political and social acceptability.
- Reducing administrative implementation and transaction costs.
- Including measurable costs and benefits to judge policy effectiveness.

- Good “science-based” decisions, where a valid scientific basis exists.
- Minimizing environmental and health risks.
- Fairness, simplicity, and enforceability.

Rather than pinpoint a set solution for a particular type of plastic, new plastic policies must be flexible. Since the technologies and markets in the plastics spectrum are continuously changing, policies tied to a particular option are almost guaranteed to eventually fail.

Plastics policies should also address concerns of competition in the marketplace. These concerns include the increasing costs of doing business and the political realities of increased fees and taxes in a depressed economic climate. Plastic is a highly diverse material, and any attempt to address plastics policy issues must include a diverse array of alternatives.

Policymakers should learn from the four existing California laws affecting plastics, and they should use this knowledge to evaluate new plastics policies. The following observations will be useful in setting new plastics policies:

- A piecemeal approach to plastics policy does not work.
- Markets change, and mandates may become ineffective or unnecessary over time.
- New uses for plastics—both virgin and recycled—are continuously being developed and changing the landscape for plastics markets.
- Because plastic products and markets are changing rapidly, stakeholders must allow extra time and effort if plastics recycling rates are to match plastic sales.
- Singling out plastic material types and single plastic resin types in policy-making is difficult. This could lead to unintended consequences, substitution of plastic materials, and inequities.
- Administering complex public policy environmental laws is difficult, expensive, and unwieldy.

- Left to the legislative process, a public policy may be amended beyond recognition and its original public policy intent may be lost.

Modifications to Existing State Plastics Laws Need to Be Made

Current legislation can be improved, as it relates to plastics and plastics recycling. Recommendations for the four existing laws addressing plastics waste, recycling, and markets are provided below.

The Integrated Waste Management Act: Recycling and Landfill Legislation

Address current IWMA incentives that maximize the quantity, but not the quality, of recycled materials. The IWMA is a weight-based diversion program. Plastics, with their light weight, will never contribute to a significant portion of IWMA diversion, especially at the household/curbside level. Unfortunately, the current law creates incentives to maximize collection weight at the curb; for example, through single-stream collection programs.

While these programs can increase the volume and weight of materials collected, they can reduce the quality of materials collected and thus the materials value and market potential. Plastics, with their high sorting costs and contamination issues, are particularly sensitive to this problem. The CIWMB and DOC should develop and expand policies and programs to increase the quality of plastics collected at the curb using incentive payments, education for recyclers, promotion of best practices, and grants for sorting and cleaning equipment, etc.

Support changes in IWMA definitions to allow some diversion credits for conversion. Before it was modified in the 2001–02 legislative session, AB 2770 (Chapter 740, Statutes of 2002, Matthews) would have allowed the CIWMB to establish programs for the research, demonstration, evaluation, and promotion of new and emerging technologies that convert solid waste materials into new sources of energy, alternative fuels, chemicals, and other products. The proposed law would have allowed cities and counties to use conversion for up to 10 percent of their diversion credits as long as certain conditions were met, such as using only post-recycled materials that would otherwise go to the landfill.

While directed primarily at biomass conversion, some conversion technologies in development convert plastics to low-sulfur diesel fuel or other products. New plastics recycling technologies and plastics conversion technologies should be formally explored and supported by the State as an alternative for plastics that cannot be currently recycled and would otherwise be landfilled. Legislation should be introduced again to enact these changes. Non-recyclable plastics might also be able to serve as a fuel source in cement kilns and other similar applications.

The Rigid Plastic Packaging Container Act

Promote programs to boost the RPPC recycling rate beyond 25 percent through collection options, education, grants for sorting and cleaning equipment, and recycling incentive payments. In 2001, the recycling rate was 26.1 percent. This is the first time the rate rose above the 25 percent threshold.

Make legislative and administrative changes to streamline implementation of the RPPC Act.

Legislation originally proposed in 2002 (SB 1970, Romero) was intended to increase flexibility and improve the RPPC law to make it easier for industry to meet law requirements. The bill would have allowed easier implementation of the RPPC law for the CIWMB. Instead lawmakers essentially scrapped the bill, removing all provisions relating to the RPPC law. This occurred largely because industry did not want to validate the RPPC law by approving the suggested changes. Rather, industry sought to try for a full repeal of the law.

Repeal the ineffective RPPC law. This should be done when a more comprehensive approach to plastics resource conservation, recycling, and market development is in place.

Redirect CIWMB staff and/or funding currently used to administer the RPPC Act to new plastic initiatives.

Plastics Trash Bag Law

CIWMB staff research and industry comments in the past year indicate that encouraging the diversion of polyethylene from landfills by establishing a market in trash bags is now unnecessary. Although the recycled-content Plastics Trash Bag Law was originally intended to serve this purpose, markets for film plastic have increased significantly over the last

two years with the advent of the composite lumber industry.

Plastic bag manufacturers—especially larger manufacturers—have faced increasing difficulty in obtaining sufficient quantity and quality of recycled resin to meet the recycled-content requirements. In addition, the law only applies to a subset of trash bags and has relatively little impact on markets for recycled plastic film in California.

However, if the law is simply repealed now, industry may have little incentive to participate in a broader, more holistic approach to plastics resource conservation and recycling that would be developed through a collaborative process. The Plastics Trash Bag Law should remain in place for the present, and CIWMB staff should continue to work with the DGS to promote and expand State purchases of recycled-content bags. The Plastics Trash Bag Law should ultimately be repealed when a broader plastics initiative is in place.

Repeal the Plastics Trash Bag Law as it is now written, eliminating the certification program, once a more comprehensive approach to plastics recycling and market development is in place. Direct the CIWMB to work with the DGS to develop a list of approved trash bag brands for sale to the State. In addition to trash bags with recycled content, examine the source reduction aspects of trash bags, or bags made of biodegradable materials, in order to develop a list of “environmentally friendly” trash bags for State procurement.

Redirect CIWMB staff and/or funding currently used to administer the Plastics Trash Bag Law to new plastics initiatives.

The Bottle Bill: Beverage Container Recycling Legislation

Make minor improvements in, and administrative changes to, the California Bottle Bill program, such as:

- Implement a commingled rate for #3 through #7 or #2 through #7 plastics. The DOC should further evaluate and implement one or more commingled rates for mixed plastics. While the markets are typically combining #2 (colored) through #7, a commingled rate for this mix could potentially reduce the incentive to sort the

higher-value HDPE. DOC should evaluate the potential impacts and trade-offs of a #3 through #7 versus #2 (colored) through #7 rate and implement one or both rates.

- Implement plastic incentive payments for recyclers. Legislation in the 2001–02 session, SB 441 (Sher), was vetoed. This bill included a provision to establish a plastic beverage container recycling incentive payment to be paid to certified recycling centers. This payment would be made contingent on available funds. The bill also would have increased processing payments made to certified recycling centers. These payments were intended to increase recycling rates for plastics, and they could be used to support and promote plastics recycling. Implementation of this program could be done equitably to promote higher quality plastics recycling. The Bottle Bill policy changes would have promoted plastics recycling and should be pursued in the next legislative session.
- Modify the processing fee for plastics. SB 441 would have also included provisions to change the processing fee paid by beverage manufacturers. Container types with a lower recycling rate would pay a higher processing fee. This would create further incentives for plastic container manufacturers to switch from less recycled plastic resins (#3 through #7) to more recycled plastic resins (#1 and #2), or to work to increase recycling rates for those less-recycled containers. This bill would have established a graduated processing fee payment. At the low end, container types with a recycling rate of 60 percent or greater would only pay a processing fee of 15 percent of the processing payment to recyclers. At the high end, container types with a recycling rate of less than 20 percent would pay a processing fee of 50 percent of the processing payment to recyclers. The changes should be pursued in the next legislative session.
- Recalculate the processing fee in 2003 based on the cost to recycle each plastics resin type. During 2003 the DOC will recalculate the cost of recycling in order to establish new processing fees and payments for implementation on January 1, 2004. For the first time since new containers were added to the program, the DOC

will establish a separate processing fee for each plastics resin type (currently, all plastic processing fees are calculated using a plastics recycling cost of \$642.69 per ton). The cost of recycling for beverage containers of plastic resin types #3 through #7 is expected to be much higher than the current cost for PET plastics. Processing fees and processing payments should increase for those plastic containers. New processing fees can have two impacts, both of which should help increase overall plastic beverage container recycling. These fees can create further incentives for manufacturers using #3 to #7 resins to switch to PET and HDPE plastics. Additionally, the fees can provide necessary support to recyclers to sort and recycle these smaller-volume plastic resin types.

- Increase market development support for plastics through grants. SB 441 would have allocated \$10 million annually for the DOC to issue grants for market development and expansion-related activities for recycling beverage containers. The grant cycles would have continued until January 2006. The legislation was intended to provide funding for research and development in the sorting, collecting, processing, shredding, or cleaning of beverage containers; identify and expand new markets for recycled beverage containers; and develop new products using recycled beverage containers. Plastics could have been earmarked as a primary beneficiary of funding if the bill was signed. Criteria for allocating the funds could have taken into account existing recycling efforts. This criteria could have ensured that funds were equitably distributed and that distributions would not disadvantage established programs and businesses. The legislation should also be pursued again in the next legislative session.

Initiate or reinstate programs as follows:

- Conduct a litter study with a focus on disposable plastics contribution to litter in general. The study should also include storm drain litter as well as the presence of CRV containers in litter generally.
- Expand the development of current new initiatives to help fund collection of plastic

beverage containers at sporting events, parks, gas stations, etc.

- Use unredeemed plastics CRV to promote plastic beverage container recycling and litter reduction, and enact legislation to allocate funds to support those efforts.

Give the beverage container program time to adjust to the new plastic containers and changing markets before making any additional changes to the beverage container recycling program. Formally re-evaluate the status of plastic beverage container recycling in 2005.

Four Key Components of a Long-Term Plastics Solution for the State

A long-term approach to promoting plastics resource conservation, increasing plastics recycling, and increasing the use of recycled plastics has four key components. Three legs of the solution are policies for: (1) plastics collection and market development, (2) plastics public information, public relations, and public education, and (3) plastics research/-development and new technologies. These three policy legs are supported by a fourth new long-term plastics product stewardship policy framework. This framework includes funding initiatives to finance programs in the first three areas.

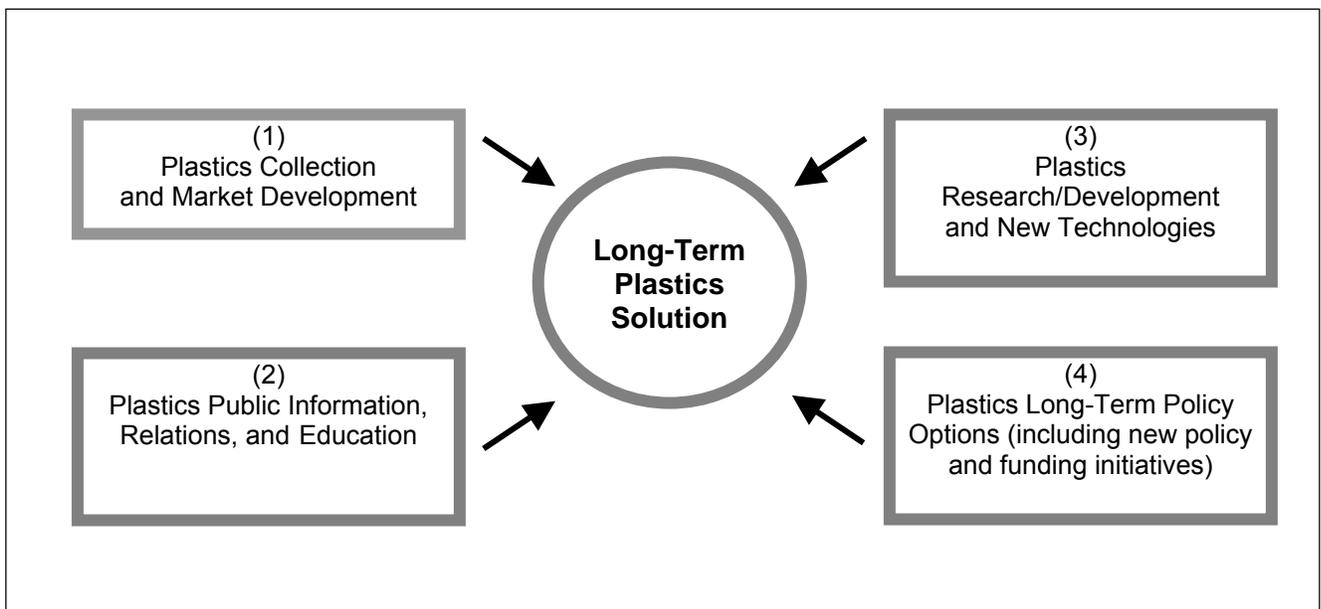
Plastics Collection and Market Development

Expanding collection is the first step to increasing plastics recycling. The key to collection is not just obtaining as much material as possible, but obtaining material of a sufficient quality and quantity. The costs of collecting and sorting plastics are high, especially relative to the value of the material. In addition, current market forces such as increases in the number of single-serve containers, new resin colors, and resin barriers can potentially increase plastic recycling costs.

Policies to promote plastic collection and markets should increase quality and quantity and reduce costs. Policies should also be equitable and not simply subsidize new operations at the expense of existing businesses. Plastic collection improvements will also stimulate plastics markets, since better quality material is more likely to attract the attention of buyers and obtain a higher price. The following six policies are intended to improve plastics collection:

1. *Provide additional funding and research support for collection and processing technology development.* Emphasize efforts that will improve the quality of incoming materials and increase throughput (for example, automation of processing lines). This policy could support

Figure 16: The Four Key Components of California's Long-Term Plastics Solution



research, pilot projects, and equipment purchases. An important aspect is that the policy should not jeopardize or put existing recyclers at a competitive disadvantage.

One option is to provide a payment to recyclers and processors, based on tons of plastics recycled, with the funds to be used for specified purposes. The recipient would be responsible for reporting recycling quantities and how the funds were used. This funding policy could be directed at plastic beverage containers, as well as other plastics collection such as film and polystyrene. These funds would be provided in addition to funding research at universities and other institutions.

2. *Develop and disseminate “best practices” in collection and processing systems to further support the economical collection of clean plastic streams.* The Association of Post-Consumer Plastics Recyclers (APR) and the Institute of Scrap Recycling Industries (ISRI) have developed criteria and standards for collection and processing plastics. These criteria should be expanded or modified, as necessary, to reflect specific conditions in California, and then disseminated to local governments, waste haulers, and recyclers. In addition, the CIWMB and DOC should work with curbside program managers to develop guidelines and information on improving the quality of plastic materials coming through the system.
3. *Provide loans and grants for the purchase of collection and processing equipment such as automated lines, washing systems, etc.* This policy would have to be implemented carefully to avoid putting companies that have already invested in such equipment at a competitive disadvantage.
4. *Develop plastic material quality standards for recycled plastics (with an industry working group).* Again, building on existing standards from the APR and ISRI, refine and promote quality standards for recycled plastics and design the material for recycling. These standards should allow recyclers to grade their materials and reduce the number of loads that are turned down by manufacturers because they do not meet

standards. Encourage manufacturers to “design for recycling.” Minimize the environmental impact of packages, including eliminating hazardous or toxic constituents in packaging. Promote and expand on existing design for recycling initiatives and standards, such as those of the APR, ISRI, and U.S. EPA.

5. *Significantly increase plastic beverage container non-residential recycling with expanded collection at points where many beverages are consumed.* These could include parks, baseball fields, soccer fields, schools, gymnasiums, swimming pools, professional sporting venues, shopping malls, airports, etc. Recycling of plastics, especially PET beverage containers, is not keeping up with sales. Beverages are being consumed away from home at various locations, often with few or no recycling opportunities.

Most consumers will not bother to bring their plastic containers home in order to recycle them, they just throw them away on-site. Californians in every community are throwing away plastic containers every day, and especially every weekend. Establishing collection programs (including weekend collection) for recyclable plastic containers at these locations could potentially provide a boost to plastic beverage container recycling. These nonresidential plastic collection programs could be established within the Bottle Bill as part of the \$10.5 million expended annually for cities and counties, part of the \$500,000 in competitive grants, and/or possible market development grants in SB 23.

As a first step, the DOC could solicit proposals from recyclers, community groups, and local governments for pilot collection programs. After implementing pilot projects in a few communities, the most effective collection programs could be expanded to other cities/counties throughout the state. Smaller local recycling companies may be in a good position to provide flexible and tailored recycling programs for California communities.

6. *Perform a financial analysis of the cost impact of plastics waste on local government waste management programs, including curbside recycling and litter cleanup.* This analysis would

include an estimated cost range to ratepayers and taxpayers of the total statewide costs of plastics waste. Though plastics are a small proportion of municipal solid waste, they consume a disproportionate share of landfill space and presumably even a larger share of California's total waste management budget.

Plastics Public Information, Public Relations, and Public Education

Historically, the State has not seen a clear and consistent public education and public relations effort to promote plastics recycling and resource conservation. Recycling education efforts usually consist of a patchwork of uncoordinated efforts between local governments, industry, the DOC, the CIWMB, and environmental education nonprofit organizations. A coordinated outreach effort is essential to help boost recycling rates and reduce confusion about plastics recycling among consumers.

The chasing arrows, although developed for resin identification, not recyclability, are often misinterpreted by consumers. Only HDPE and PET plastics are recycled with any significant frequency, yet many consumers are led to believe that any container with a chasing arrow code is recyclable. Furthermore, some manufacturers use claims of recyclability to help sell their products when in fact, the products are not recyclable.

This creates a false sense of security for industry. False recycling claims, or erroneous claims about recyclability on packaging, mislead consumers and hurt recycling efforts for those plastics that can truly be recycled. There is a need for clear, consistent messages on plastics recycling with an emphasis on truth in advertising.

The impression from much of the industry-based recycling publicity is that plastics are more recyclable than they really are. These messages are counterproductive to the broader plastics recycling movement, and they create confusion among consumers about what plastics are effectively recyclable.

Because of these false messages, many consumers are under the impression that they should have recycling opportunities for all plastics. They think so even when providing these opportunities is not technically or economically practical. In addition,

consumers become even more disenchanted when they find out that some plastic materials that are being dutifully collected are not being recycled.

Expanding plastics education efforts must be different than most of the past efforts to date. Consumers have a strong need, and an insatiable demand, for ongoing education programs. The programs must identify what is recyclable, where it can be recycled, why it should be recycled, and why consumers must not litter plastics and other materials. These efforts should be coordinated and extensive. A potential model is the aggressive statewide anti-smoking campaigns of the last several years.

Policy makers should consider adopting the following nine policies and programs for plastics education, public relations, and information:

1. *Increase resource conservation and recycling education coordination efforts through collaboration between State and local government, environmental groups, and industry.* Create a "Plastic Recycling Council" consisting of representatives from State and local government, industry, retailers, recyclers, environmental groups, consumer groups, educators, and public relations firms. The council could be funded through government and public and private entities to conduct public awareness campaigns. The council could initiate joint industry/government outreach campaigns to increase plastics recycling and resource conservation. Innovative initiatives, such as lotteries or prizes for certain plastics, should be included.
2. *Use additional California Bottle Bill surplus funds in the near term for expanded plastics beverage container recycling publicity and public education, especially on litter issues.* Continue the extensive education efforts initiated in 2001 to support container expansion, especially for recyclable plastic types.
3. *Identify the specific reasons that consumers are not recycling certain plastics, and identify potential barriers and problems that should be addressed in outreach efforts for different plastic types.*

4. *Enforce truth-in-advertising about recyclability of plastics packaging and other plastic packaging characteristics, such as biodegradability.* False advertising claims should be identified and forwarded by the CIWMB to the State Attorney General’s Consumer Protection and Business Information program for prosecution using existing truth-in-advertising statutes. The State could establish a clearinghouse for evaluating these claims.
5. *Develop a California curbside label for plastic products that can be recycled in every curbside program* as a way to motivate manufacturers to increase recyclability of their packaging. The

State could facilitate this initiative without additional legislative authority.

6. *Develop a “designed for recycling” seal of approval that could be awarded to plastic containers for sale in California with high levels of recyclability.* Develop an innovative plastics packaging award for new packaging that has high recyclability, recycled content, or source reduction features as part of the CIWMB’s Waste Reduction Awards Program (WRAP).
7. *Develop and publicize a list of recycled-content and environmentally friendly plastic products for State and local government procurement.* In addition, publicize the list more broadly; for

Plastics Markets Need to Be Encouraged

Market development policies generally consist of three types—recycled-content mandates, buy recycled programs, and support for manufacturers of recycled products. California has policies and programs in place in all three areas. The recycled-content requirements for plastics have been somewhat disappointing regarding their impact on plastic markets in California. Unlike the glass and newspaper recycled-content laws—where materials collected in California are used in California products—much of the recycled-content plastic for plastic containers is collected and made into containers out of state.

The buy recycled program is improving, but it could be stronger to support manufacturers of recycled plastic products. The DOC and the CIWMB assistance programs for recycled product manufacturers are strong. The Recycling Market Development Zone Program operated by the CIWMB and the market development outreach and grants programs operated by the DOC are compatible programs. Both support manufacturers of recycled products.

Following are three policies recommended to promote plastic markets:

Expand, enhance, and enforce existing government recycled-content purchase policies and environmentally preferred procurement programs for plastics.

Create positive incentives for companies selling recycled plastic-content products (both open- and

closed-loop), such as tax credits, tax deductions, and exemption from fees. Do not use recycled-content mandates for plastic products. One alternative within the beverage container program is to reduce processing payments for manufacturers of plastic beverage containers that use recycled content at or above a certain level, such as 10 percent. Another option would be for companies to certify a content level percentage above some established percentage, and above existing California sales quantities. They would receive a tax credit or deduction per ton of recycled resin used. The deduction or credit could be greater if the recycled plastics came from California. This initiative would require random audits to verify the recycled-content claims.

Develop public policies that help level the playing field for biodegradable plastics. Without government stimulation, the current price differential between petroleum-based plastics and biodegradable plastics is likely to hinder the growth of biodegradable packaging and other applications in the short-term. Research and development tax credits, or other jump-start subsidies, need to be considered to help narrow this price differential. These options could include user taxes on non-degradable plastic bags and/or tax credits for biodegradable plastic bags.

Develop public policies to support conversion technologies. This includes engineering, environmental, and financial feasibility analyses, permit streamlining, collection assistance, and other policy support.

example, to large companies and consumers.

8. *Increase litter reduction education efforts, as part of the above measures, through collaboration between State and local government, environmentalists, retailers, and industry.* Conduct an extensive public education effort on litter and on the impacts of litter, particularly plastics litter. Identify key age and interest groups to target in the campaign, and tailor messages to those audiences. Evaluate behavioral reasons for littering, and address those issues in the campaign. Work with existing organizations, such as Keep America Beautiful (KAB), Keep California Beautiful (KCB), the California Coastal Commission, industry, retailers, environmental, and community groups to promote anti-litter efforts.
9. *Explore making littering a civil offense, and begin instituting litter tickets, like parking tickets.* Consider establishing a hotline where the public could call in the license plates of litterers, much like the existing gross polluter hotline. Also, consider the concept of an environmental court for pursuing environmental crimes such as littering and solid waste violations.

Plastics Research/Development and New Technologies

Plastics technologies have a great need for timely policy and program aid, legislative backing, and financial support. This is true for emerging—and presently commercialized—plastics technologies. Advancing new plastics technologies will require significant leadership and technical and financial assistance from both the CIWMB and the DOC.

The State needs to focus more on advancing plastics technologies that have tremendous promise to help solve many of the its fundamental plastics issues. The same California that produced the world-class computer industry of Silicon Valley surely can lead the world in advancing state-of-the-art plastic technologies.

Plastics conversion technologies, biodegradable plastics and composting, and other new plastics recycling technologies offer much promise to help mitigate plastics environmental issues, develop new plastic end products, and increase plastics diversion from landfills. However, their actual environmental

performance, cost, and impacts on existing State goals and programs have yet to be determined.

Both the CIWMB and the DOC must get involved in these plastics technology initiatives to help lead and evaluate these efforts. The State needs to carefully evaluate and balance the impacts and effectiveness of new plastics technologies. New technologies will not solve all of California's plastics problems; in fact, it may create some new problems. But technology is a critical piece of the long-term plastics solution.

New plastics technologies have tremendous implications for local government jurisdictions. Currently, many waste haulers will not pick up all types of plastics because markets are unavailable. If effective and economic plastics conversion technologies existed, local jurisdictions would be motivated to collect all plastics. This would include film plastics and packaging.

A new campaign to collect all plastics at the curbside would replace previous curbside plastic bottle collection programs, with a positive sort at the back end for PET and HDPE plastics. Identifying, collecting, and sorting plastics for conversion technologies and composting biodegradable plastics are significant public policy issues that must be addressed.

Future plastics technology will likely drive future plastics collection practices, and this will be particularly true on a jurisdiction-specific basis as local entities begin to pilot new plastics processes. Local jurisdictions will need help in funding their future large-scale plastics collection operations to be able to obtain sufficient volumes of plastic materials to overcome economic scale problems. A key issue is that plastics conversion, and even biodegradable plastics and composting, should not replace higher-value plastics recycling. Plastic materials should only go to conversion and biodegradable plastics and composting facilities when they cannot be recycled.

Provide support for and undertake forums and workshops on plastics initiatives, including promising and significant plastics technologies.

These could include plastics conversion technologies, biodegradable plastics and composting, auto shredder plastics recycling, commingled/mixed plastics processors for recycled value-added products, and many others to be determined. The

CIWMB previously spearheaded several initiatives on conversion technologies. CIWMB and DOC should now begin the following plastics technology initiatives:

1. Work with other State agencies on plastics conversion technologies, biodegradable plastics and composting, and other technology issues. The agencies should form an external industry advisory group for plastics technologies and sub-technology applications.
2. Plan public education workshops and symposia that focus on city and county officials, and the general public. The State agencies should work with private industry partners on specific information needs regarding plastics conversion technologies, biodegradable plastics and composting, and other new plastics technologies that can keep plastics out of landfills and the environment.
3. Develop a budget change proposal seeking State General Fund support for a grant program for small-scale demonstration projects that use plastic conversion technologies, biodegradable plastics and composting, and other new plastic technologies.
4. Work with biodegradable plastics firms to help develop pilot projects to demonstrate and evaluate new technologies and commercial applications. (Examples include reusable compostable grocery bags, compostable yard waste bags, and biodegradable food service containers.)
5. Work with the California Pollution Control Financing Authority, Technology, Trade and Commerce Agency, and other applicable State agencies to ascertain existing funding availability for plastics conversion technologies, biodegradable plastics and composting, and other new plastics technologies. The State agencies should work with applicable federal agencies on existing funding opportunities for California plastics technology projects.
6. Work with Cal/EPA to set up a streamlined permitting process for assisting project proponents of appropriate plastic technology projects.

Support plastics conversion by addressing the barriers that limit further commercialization of plastics conversion technologies. This includes technical and financial assistance with (1) financing for commercial-scale plastic conversion facilities, (2) large-scale plastic collection practices, (3) permitting plastics conversion and other new facilities, and (4) further statutory and/or regulatory relief, as appropriate, or required.

Provide government stimulation to address the current price differential between petroleum-based plastics and biodegradable plastics. This differential is likely to hinder the growth of biodegradable packaging and other applications in the short-term. The CIWMB and the DOC need to consider ways to help narrow this price differential now, including the use of research and development tax credits or other jump-start subsidies.

A Structured Collaborative Process Needs to Begin Now to Develop Shared Responsibility for Plastics in the State

One constructive way to develop effective, long-term solutions to plastic issues in California is through a highly structured collaborative approach involving all vested parties. Stakeholders would include industry (resin, container, and product manufacturers), distributors, retailers, recyclers, processors, reclaimers, State and local government, environmental groups (involved in solid waste, water quality, and coastal issues), consumer groups, and other interested individuals and organizations.

The CIWMB and the DOC could try to independently develop policy solutions, mandates, or legislation for long-term policies to increase plastics recycling, resource conservation, and use of recycled plastics. However, the political process would likely manipulate any carefully thought-out policy package that does not have broad stakeholder support, diluting the intended policy effects.

A more effective approach would be for all key stakeholder parties to develop and generally agree on an approach, and then help execute it (perhaps initially with little, or no, legislative mandates). The final outcome of the collaborative process should be determined by the stakeholders. The CIWMB and DOC can begin now to draw on the momentum

established through the white paper process to help initiate and formalize a collaborative process.

If a collaborative process cannot be effectively implemented in a timely way with substantive outcome results, a direct legislative process will likely be necessary to fill this void. If plastics stakeholders do not act, and act in a timely manner, only the direct legislative process may keep all vested parties at the table for the hard decisions that will have to be made.

Initiating a Collaborative Process for Shared Plastics Responsibility

Beginning with those involved in this white paper development—and including any other interested stakeholders—the DOC and the CIWMB should develop a list of potential participants in a collaborative process for shared plastics responsibility. The process should be inclusive, accepting any members that are interested in active participation. It should encourage participation from all involved parties, particularly those that have not been as involved to date, such as retailers. The CIWMB and the DOC should support and help facilitate this process.

At a startup meeting, the group should divide itself into at least four task forces: (1) plastics collection and market development, (2) plastics public information, public relations, and education, (3) plastics research/development and new technologies, and (4) plastics product stewardship and shared financial responsibility. The collaborative process could be established voluntarily, or it could also be established through legislation that would allocate funding and identify participants and a timeline.

Guidelines for a Collaborative Process for Shared Plastics Responsibility

The task forces should meet regularly to:

1. Identify and develop specific goals, policies, and initiatives that will meet the State's objectives for plastics, including increasing plastics resource conservation, increasing plastics recycling, and increasing the use of recycled plastics.
2. Develop and support legislation, if needed, to implement new plastics policies and programs.

3. Implement plastics policies and initiatives, as appropriate.

4. Report on progress to the overall group.

Each subgroup should develop specific objectives building on relevant issues, policy goals, and policies presented in this white paper. The collection and market development group may want to identify recycling rate targets for different plastic products and packaging.

The first three groups, to a greater extent, will be considering policies and initiatives that are somewhat less controversial and that could be implemented in the short term. The fourth group will be considering more controversial policy options on a longer time frame. This fourth group, in particular, should take care to acknowledge the input of all participants and all subgroups.

Plastics Policy Options for a Collaborative Process to Consider

Some of the policies discussed in this white paper could serve as a guide for the first three task force groups. Most all of the future plastic policies require some funding. Although some initiatives can be funded from existing sources, new sources of funding for many of the initiatives will be necessary. The long-term policy group should discuss and consider a range of alternatives that could generate funds to support adopted policies as well as new future initiatives.

Policies should attempt to internalize plastic's externalities while recognizing the many benefits of plastics. This means the policies should quantify the costs associated with the "external" aspects of plastics (societal and environmental costs) and include those costs into the cost for plastics. This is a kind of "full-cost" accounting.

Any new policies requiring payment are inherently controversial, especially in a time of economic recession. However, postponing the plastics issue is irresponsible and likely to result in greater total costs in the long-term. The plastics policies most likely to be successful are those that share costs between all responsible parties and provide a mix of alternatives.

The final result of the collaborative process would be implementation of a new set of policies and programs that optimize the use, recycling, and

disposal of plastics in California. The collaborative process should also result in better working relationships between various plastics stakeholders, enabling them to identify and implement mutually beneficial initiatives of their own, if possible.

Should Landfill Tipping Fees Be Increased In the State?

Landfill tipping fees in California are relatively low—averaging approximately \$35 per ton in 2000. With such a low cost, throwing plastics away is easier and more economical. A higher tipping fee would create greater incentives to recycle or otherwise divert plastics and other materials. Higher tipping fees also would generate additional revenues that could be used to support new plastics programs and policies.

But raising the fee is likely to be politically unacceptable, since it would need to be high enough to create an effective incentive to increase plastics diversion. A lower fee increase would be more politically acceptable, but it would not create enough incentives to change behavior. However, a lower fee would generate some funding.

Increasing the landfill tipping fee places the burden of increased fees on the consumer, hauler, and local government. Increasing tipping fees may be considered as part of any plastics funding package. However, an adequate pricing signal may not be passed through to manufacturers to reduce wastes.

Industry Can Help Initiate Plastics Solutions

California's long-term plastics solutions need not be legislatively mandated, or even government directed. On the international level, several models of industry-led initiatives exist in which a private consortium organizes a collection and funding effort. In the Canadian provinces of British Columbia (household hazardous waste programs) and Manitoba (product stewardship system), industry is given a legislative mandate to meet a certain goal. Industry is allowed to choose the approach to achieving the goal.

Alberta, Canada, has a milk container recovery system in which industry has taken the initiative upon itself. The packaging covenant of New Zealand and Australia is a similar example of industry

choosing to avoid legislative mandates that may be more onerous.

These privatized initiatives provide a potential model for California's efforts to optimize plastics use, recycling, and disposal. Typically, an organizing board is established that includes government, industry, and environmental representatives. Industry would develop collection, recycling, or other programs, and establish a membership fee or other funding mechanism to support those programs. A privately established system has the advantage of increased flexibility and lower administrative costs, and it allows industry greater control over the types of programs that are funded. Such a system would also provide an ongoing forum to discuss and promote plastics initiatives among interested stakeholders.

The four plastics task forces suggested here could be organized under a private, nonprofit corporation consisting of a board of directors with nine or more members. The board seats could include (1) State government, (2) local government, (3) environmentalists, (4) retailers/consumers, (5) resin manufacturers, (6) container manufacturers, (7) packaging manufacturers, (8) product manufacturers, and (9) recyclers/processors. Each board seat could provide funding to the nonprofit corporation in relation to the board's seat representation.

A Suggested California International Symposium for Plastics

The CIWMB and DOC, in coordination with other interested organizations, could host an International Symposium in 2003 tentatively titled "New Technologies and Smart Policies for Optimizing Plastics Use." The goal would be to continue the process initiated by this white paper and further the development of plastics technologies, plastics issues, and future plastics policies.

This symposium would showcase new and emerging plastics technologies and policies from around the world and further develop California plastics issues and potential solutions. Progress made at this symposium would continue through four (or more) ongoing subcommittees to further optimize plastics use in California. These four working subgroups would be (1) plastics collection and market development, (2) plastics public information, public relations, and education, (3)

plastics research/development and new technologies, and (4) plastics product stewardship and shared financial responsibility.

The State Needs Smart Plastics Policies

The agenda for future California plastics policies and programs should be one of “smart policies.” These policies should entail true collaboration with industry to establish a policy framework for optimizing and managing the state’s entire plastics stream. The policies should cover production and use, recycling and the use of appropriate technologies, and finally, disposal.

Smart policies would set aside pro forma business and environmental positions and let the collaborative process follow scientific data and analyses, and good public policy concerning plastics, wherever that may lead. In managing plastics, industry should learn to speak the vocabulary of consumer and environmental benefits and protection.

Smart plastic policies would consider helping level the secondary/virgin and recyclable/non-recyclable material playing field to reflect the true and full costs of plastic materials through their entire lifecycle. Market forces can slowly change plastic public policies, but smart plastic policies can help catalyze the development of breakthrough plastic technologies to quickly gain their environmental benefits for the state.

Smart policy plastic stakeholder collaborations would entail more thoughtful arguments that go beyond simple questions of cost to industry and consumers. They would also acknowledge quantifiable and non-quantifiable costs and benefits to the state at large. Also, smart policies should meet standards for balancing costs and benefits, and should include other factors such as fairness, lifestyle, and impacts on smaller companies.

Should Plastics Manufacturers Be Assessed Additional Plastics Payments?

Some members of the plastics industry have already made significant contributions to plastics recycling in California. Industry can provide increased funding support, especially as part of a broad collaborative initiative. Such an initiative will probably be more successful than the independent and more discreet industry efforts undertaken in the past.

Industry could expand its support of plastics initiatives in a number of ways. These include funding specific earmarked programs, voluntary deposit systems (payment of an amount to be determined) paid into a plastics fund based on sales in California, or mandatory fees or deposits. Mandatory fees will be unpopular among industry groups and complicated to implement for both government and industry. However, developing fee systems that would be fair and acceptable may be possible.

Mandatory deposits could be complicated, unless blended into the existing Bottle Bill system. Some products or packages may be appropriate for a voluntary deposit system; the manufacturers of these products should investigate this type of system. Two examples of potential voluntary deposits are the

Alberta Dairy Council Plastic Milk Container Recycling Program, and deposits on car batteries to encourage returns to the retailer. Industry groups may also choose to self-fund initiatives for their products and packaging, such as the Plastic Loosefill Council’s recycling program for packaging peanuts. These programs all provide funding for fairly specific products and packaging.

More generalized industry support of plastics recycling and resource conservation is necessary. One alternative would be to establish a payment based on sales of plastic goods in California, which would then be used to fund new plastic policy initiatives. Like the National Packaging Covenant in Australia and New Zealand, the fees could be based on sales. The fees could also be supplemented by State funding. The task forces could develop specific criteria for uses of the funds. Companies could choose to contribute to the fund voluntarily, or the fee could be mandatory. This type of fee would be much simpler to implement than an advanced disposal fee on individual products or packages sold in the state.

Smart policies would recognize the need to internalize the economic and environmental externalities associated with plastics and equitably share these costs between all involved parties. Smart policies would incorporate simple and straightforward market-based solutions that require both producers and consumers of plastics to internalize the costs and responsibilities for meeting plastic waste reduction and recycling goals.

Smart policies would acknowledge the inevitability of change from our current, ineffective status quo plastics policies, and focus more on helping to develop new and better policies and programs to manage plastics. Smart plastics policy efforts would spend less time and money on questioning the need for new plastics policies in California and spend more resources on development and working design of the policies.

California's long-term plastics management solution should not simply be another "band-aid" repair of our current plastic laws. The solution to California's plastics issues will be a new model, unique to the State, much like the California Bottle Bill and the IWMA program have been during the past dozen years.

The California plastics solution will most likely be a "clean sheet of paper" approach, or a "day one concept," rather than additional focused

Bit of Advice From the '60s Proved Visionary

In the 1960s film *The Graduate*, the aimless collegiate, Ben, contemplating his future, is soberly informed by a meddling family friend:

"Ben—I want to say one word to you—just one word—'plastics.'"^{*}

^{*} Calder Willingham penned these words in the 1967 screenplay.

improvements to our existing plastic institutions. California has the opportunity to be a leader in plastics management, not only among the other states and the federal government, but internationally as well.

Government, industry, and environmentalists must continue to confront these difficult and often contentious plastics issues. The collaborative process will not be easy; developing and implementing effective and long-term plastics policies for California will probably take several years. But this plastics white paper initiative may be the beginning of a fruitful dialogue and collaboration between all interested plastics stakeholders to seek new solutions for California's plastics challenges.

Table 2: Summary of Plastic Policy Options

Policies and Programs	Lead Agency	Time Frame	Ease of Implementation	Cost	Goals			Requires Legislation
					Increase Recycling	Increase Resource Conservation	Increase Use of Recycled Plastic	
Modifications to Existing Laws								
Address IWMA incentives	CIWMB	Medium	Moderate	Moderate	Direct	Direct	Indirect	Possible
Legislate changes in IWMA definitions	Legislature	Medium	Moderate	Low	Indirect	Indirect	Direct	Yes
Promote RPPC recycling rate	CIWMB	Medium	Moderate	Moderate	Direct	Direct	Indirect	No
Streamline RRPC law	CIWMB	Medium	Difficult	Low	Indirect	Indirect	Indirect	Yes
Replace RPPC law with new initiatives	All	Long	Difficult	Low	Indirect	Indirect	Indirect	Yes
Redirect RPPC staff	CIWMB	Long	Easy	Low	Indirect	Indirect	Indirect	Yes
Work with DGS for trash bag procurement	CIWMB	Short	Easy	Low	Neutral	Indirect	Indirect	No
Replace the trash bag law with new initiatives	All	Medium	Moderate	Low	Neutral	Neutral	Neutral	Yes
Redirect trash bag staff	CIWMB	Medium	Easy	Low	Indirect	Indirect	Indirect	Yes
Implement commingled rate for #2 to #7	DOC	Short	Moderate	Low	Indirect	Indirect	Indirect	No
Legislate plastic incentive payments	Legislature/DOC	Short	Moderate	Moderate	Direct	Direct	Indirect	Yes
Modify plastic processing fee	Legislature/DOC	Short	Moderate	Moderate	Indirect	Indirect	Indirect	Yes
Recalculate processing fee in 2003	DOC	Medium	Moderate	Moderate	Indirect	Indirect	Indirect	No
Conduct DOC litter study	DOC	Medium	Moderate	Moderate	Neutral	Neutral	Neutral	No
Increase market development support for plastics	Legislature/DOC	Medium	Moderate	High	Direct	Direct	Direct	Yes
Apply Bottle Bill plastic surplus to support plastic beverage container recycling	Legislature	Medium	Moderate	Low	Direct	Direct	Indirect	Yes
Re-evaluate Bottle Bill plastics in 2005	DOC	Long	Moderate	Moderate	Neutral	Neutral	Neutral	No
Collection and Market Development								
Support for collection and processing	All	Medium	Moderate	High	Direct	Direct	Direct	No
Develop and publicize collection and processing and best practices	CIWMB/industry groups	Short	Easy	Low	Indirect	Indirect	Indirect	No
Implement loans/grants for equipment	CIWMB/DOC	Medium	Moderate	Moderate	Direct	Direct	Direct	Yes
Develop and publicize plastic quality standards	CIWMB/industry groups	Medium	Easy	Low	Indirect	Indirect	Indirect	No
Implement new location collection programs	DOC	Short	Moderate	Moderate	Direct	Direct	Indirect	No
Support for processing agricultural film	CIWMB	Short/Medium	Moderate	Moderate	Direct	Direct	Direct	No
Support for film collection from small/medium-sized commercial generators	CIWMB	Short/Medium	Moderate	Moderate	Direct	Direct	Direct	No
Expand buy recycled procurement programs	CIWMB/DOC	Short	Moderate	Low	Indirect	Direct	Direct	No
Implement positive incentives for recycled content (open- and closed loop)	CIWMB	Medium	Moderate	Low	Indirect	Direct	Direct	Yes
Public Information, Public Relations, Education								
Initiate plastics recycling council	All	Medium	Moderate	High	Indirect	Indirect	Indirect	No
Conduct aggressive education campaign	CIWMB/DOC	Medium	Moderate	High	Indirect	Indirect	Indirect	Possible
Apply Bottle Bill surplus for education	Legislature/DOC	Medium	Easy	High	Indirect	Indirect	Indirect	Yes
Identify barriers to recycling	CIWMB/DOC	Medium	Moderate	Low	Indirect	Indirect	Neutral	Low
Enforce truth in advertising	CIWMB	Medium	Moderate	Moderate	Indirect	Indirect	Indirect	No
Establish California curbside label	CIWMB/DOC	Medium	Moderate	Moderate	Indirect	Indirect	Neutral	Possible
Implement design for recycling approval awards	CIWMB	Medium	Moderate	Low	Indirect	Indirect	Indirect	No
Develop and publicize list of recycled-content, positive products	CIWMB	Medium	Moderate	Low	Indirect	Indirect	Indirect	No
Increase litter education	CIWMB/DOC	Medium	Moderate	High	Neutral	Indirect	Neutral	Possible
Enforce litter violations	CIWMB/DOC	Medium	Difficult	High	Neutral	Indirect	Neutral	Yes
Promote research and unbiased information-sharing on plastic health impacts	CIWMB	Medium	Easy	Moderate	Neutral	Indirect	Neutral	No
Research/Development and New Technologies								
Provide technical support for new technologies	CIWMB/DOC	Medium	Moderate	Moderate	Direct	Direct	Indirect	Possible

Policies and Programs	Lead Agency	Time Frame	Ease of Implementation	Cost	Goals			Requires Legislation
					Increase Recycling	Increase Resource Conservation	Increase Use of Recycled Plastic	
Provide financial support for new technologies	CIWMB/DOC	Medium	Moderate	High	Direct	Direct	Direct	Yes
Evaluate new technologies	CIWMB/DOC	Short	Easy	Low	Indirect	Indirect	Indirect	No
Support collection for new technologies	CIWMB/DOC	Medium	Moderate	High	Direct	Direct	Direct	No
Support conversion technologies	CIWMB	Short	Easy	Moderate	Direct	Direct	Direct	Possible
Implement government stimulation for biodegradables	CIWMB	Medium	Moderate	Moderate	Neutral	Direct	Neutral	Yes
Conduct forums and workshops for new technologies	CIWMB	Medium	Moderate	Moderate	Indirect	Indirect	Indirect	No
Work with agencies and industry advisors to support new technologies	CIWMB/DOC	Medium	Moderate	Low	Indirect	Indirect	Indirect	No
Conduct technology education symposium for cities and counties	CIWMB/DOC	Medium	Moderate	Moderate	Indirect	Indirect	Indirect	No
Establish grant program for demonstration project	CIWMB	Medium	Moderate	Moderate	Direct	Direct	Direct	Yes
Work with Calif. Pollution Control Financing Authority and the Technology, Trade & Commerce Agency to fund technologies	CIWMB	Short	Easy	Low	Direct	Direct	Direct	No
Streamline permitting with Cal/EPA	CIWMB	Short	Moderate	Low	Indirect	Indirect	Indirect	No
Structured Collaborative Process								
Initiate a collaborative process	CIWMB/DOC	Short	Moderate	Moderate	Indirect	Indirect	Indirect	No
Form task forces and guidelines	All	Medium	Moderate	Low	Indirect	Indirect	Indirect	No
Conduct task force meetings and policy development	All	Medium/Long	Difficult	Moderate	Indirect	Indirect	Indirect	No
Conduct an international symposium	CIWMB/DOC	Medium	Moderate	Moderate	Indirect	Indirect	Indirect	No
Develop and implement long-term policies	All	Long	Difficult	High	Direct	Direct	Direct	Possible
Develop measurement methods and credits for source reduction	CIWMB	Medium	Moderate	Low	Neutral	Direct	Neutral	Low
Implement privately operated nonprofit plastics consortium	Industry groups	Medium/Long	Moderate	Moderate	Indirect	Indirect	Indirect	No
Funding Mechanism—Long-Term Policies								
Increase landfill tipping fees	CIWMB	Long	Difficult	Moderate	Indirect	Indirect	Indirect	Yes
Implement voluntary deposit or fee systems	Industry groups	Long	Moderate	Moderate	Direct	Direct	Direct	Yes
Implement mandatory deposit or fee systems	DOC/CIWMB	Long	Difficult	Moderate	Direct	Direct	Direct	Yes
Implement mandatory industry funding based on sales	CIWMB/DOC	Long	Difficult	Moderate/high	Indirect	Indirect	Indirect	Yes
Implement voluntary industry funding based on sales	Industry groups	Long	Moderate	Moderate/high	Indirect	Indirect	Indirect	No
Establish taxes on virgin materials/non-biodegradable products	CIWMB	Long	Difficult	High	Indirect	Indirect	Direct	Yes

Key:

“All” refers to State agencies, Legislature, industry, and environmental groups.

Time Frame: Amount of time needed to initiate program. “Short” is less than one year; “Medium” is 1–2 years; “Long” is more than 2 years.

Ease of Implementation: “Easy” can be done in-house; “Moderate” requires more significant shifting of staff and/or resources; “High” requires significant change within agencies or stakeholder groups.

Cost (overall expected costs): “Low” is relatively inexpensive, within existing budgets; “Moderate” requires some additional budget; “High” requires significant new funding from one or more sources.

Goals: “Direct” means policy would lead to direct progress towards achieving the goal; “Indirect” means policy would indirectly improve the goal; “Neutral” would have no impact.

Requires Legislation: “Possible” means that policy could be done without legislation, but a legislative effort might be beneficial.

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