Government Regulations

Federal Guides for the Use of Environmental Marketing Claims (supersedes state regulations)

* Any sort of qualifications a plastic product has (compostable, etc.) must be conspicuously labeled
* California has more specific guides (of course)
* Environmental claims about a product or package should specify if the claims are for the product itself, its packaging, or anything

Maryland ([Source: MD Code and Court Rules](https://advance.lexis.com/container/?pdmfid=1000516&crid=04ea4350-5123-4471-8047-6d307fd6f195&config=00JAA1NTM5MzBmZC02MTg2LTQzNmEtYmI5Yy0yZWEwYzA1OGEwNTYKAFBvZENhdGFsb2fdgr2eooaZj7MpSZGOIwWq&ecomp=yg7dk&prid=d425d9a2-bc54-4407-8884-45e71ec169a5))

Environment § 9-1710 (Plastic Containers)

* Plastic containers mean rigid plastic containers and bottles
* Rigid plastic containers are non-bottle formed or molded containers that are intended for single use, predominately composed of plastic, have inflexible finite shapes or forms, and have a capacity between 8 ounces and 5 gallons.
* Plastic bottles are containers that have a neck smaller than the container part, also intended for single use, and have a capacity between 16 ounces and 5 gallons.
* Such containers must be labeled from 1-7, depending on the type of plastic resin used
* Knowingly distributing a plastic container with no label may incur a $50 fine

Environment § 9-21XX (Plastic Products)

* Maryland defines plastic as a material “made from linking monomers through a chemical reaction to create an organic polymer chain that can be molded or extruded at high heat into various solid forms that retain a defined shape during use by a consumer.”
* Plastic products refer to products that contain plastic (with or without other materials) unless they are personal care products (non-prescription products that can be rubbed, poured, or sprayed on like shampoos)
* As of October 1st, 2018
  + Plastic products cannot be labeled as compostable or home compostable unless it meets the ASTM D6400 (compostable) standard, the ASTM D6868 (biodegradable) standard, the OK Compost Home certification, or any federal guidelines
  + Compostable plastic bags, food, and beverage must be labeled with the word “Compostable.” Bags which are compostable may not be labeled as recyclable.
  + Any mislabeling or failure to label bags appropriately may incur a civil penalty of $500 for the first violation, $1000 for the next violation, and $2000 for a subsequent violation. The fine is paid to the local government who enforced it.

Environment § 9-22XX (Expanded Polystyrene)

* Maryland defines expanded polystyrene as “blown polystyrene and expanded and extruded foams that are thermoplastic petrochemical materials utilizing a styrene monomer and processed by a number of techniques, including fusion of polymer spheres (expandable bead polystyrene), injection molding, foam molding, and extrusion-blow molding (extruded foam polystyrene).”
* An expanded polystyrene food product includes products like plates and trays that are used to sell or distribute foods and beverages that are made of expanded polystyrene unless the product is or was
  + Used to packages raw meats or seafood
  + Not made with foam
* Note that food itself that has been packaged in an expanded polystyrene food product previously is not illegal
* Counties and municipalities reserve the right to enact more stringent standards.
* On or after July 1st, 2020
  + Expanded polystyrene food service products may not be sold or distributed by a business or school
    - However, manufacturers can store food service products with expanded polystyrene in Maryland for distribution elsewhere
    - The Department of the Environment can waive the new law for a food service if complying would present an “undue hardship”
  + The Department of the Environment needs to conduct a “public education and outreach” campaign during implementation
    - In addition to educating the public about plastics and foams, they also need to spearhead an antilittering campaign
  + Penalty is $250 per violation, but a warning must be given 3 months in advance to noncomplying businesses and they cannot be penalized if they comply within 3 months of receiving the warning

Business Regulation § 19-308 (Secondary Plastic Packaging)

* Plastic secondary packaging means a plastic crate, shell, tray, or anything else used for bulk transport or storage of retail items
* It is prohibited to purchase four or more of such items for the purpose of recycling shredding or destroying the items
* Anyone who purchases items of plastic secondary packaging must make a written record of each transaction of purchasing four or more items at once, proving that the seller has lawful possession of the plastic. The record must include:
  + Name, address, telephone number, and signature of the seller or their authorized representative
  + Name and address of the purchaser
  + Registration number and license tag of relevant delivery vehicles
  + Description of items sold
  + Date of transaction
* A first violation may lead to a $1000 fine or imprisonment for 1 year. Further violations may lead to 3 years imprisonment or a fine not exceeding $2500.
* Despite the regulation being called “Business Regulation,” this section applies to any individual, corporation, or other entity.

California State Code ([Source: California Law Code Search](https://leginfo.legislature.ca.gov/faces/billSearchClient.xhtml))

* Regulations are the Same as Maryland Environment § 9-1710 (Plastic Containers) except the fine for manufacturing rigid plastic unlabeled is $1000

Circular Economy

Circular Economy ([Main](https://mail-attachment.googleusercontent.com/attachment/u/0/?ui=2&ik=d304c16109&attid=0.1&permmsgid=msg-f:1669985320077378384&th=172cfaccf7544350&view=att&disp=inline&sadnir=1&saddbat=ANGjdJ95D0U_Y319Ef9JECMcuAK_TFl_RGuXD6_c2JjlijsMKTev0ksgT6kUYF6ZTqSn0oEBxmONo2cnkP7bICZ_ccgNUmfhaY8ka7j_OSjVYerJ3LSX3LJ5LZS-yis6RAOwBsxLHTdbsLlMXw4AxHZkodmUweYOIJy0SWV-9vG5eXuVTf83HRDYI-EpUDYzTLt0_DYBEqMlF5cqZgXDHsKruep-K1PvceoAUBrVW6TpHMOLBUVLCpA6_HhXjomJEiXkfxeuzo9nrPYg7ggLr1qSMAhIogCEWn8Aw6SAhMUbaUU6Z16yZeZNKW4IHj8rvLESuOLHuWZUTPUyQfnF-Ji7EzF7UBW_nlCvyy-BfTLYFgrOGaSsP4-44pZDrYVJdkIA3XE7QLHaEvaJAZX6bALWi6RMzsFFDIJoggxnBUS8wWw38adrnA2uy2Cf6l51slF-AQx447KKqtffhgpmOig6Yf6wsmqhSYSHoaX3hOWKRCafaoMNLp5qdbiaAveRJqQAr3InE21tmkAZ4wvLDRihD3h3yZgeGcNRSvzf4y74Y6YK5DL8Y9L_mWndtJN350FgBS6jNiXurX9hjNZHPhO2BBZJO30LjVY3awblhCZU6zRjbkoQFHqCNnG4LCEuW661ZT9d5zXBg4Z3lkWRiIbkMfYRICk96CMvx-RJP68IxxzOAykeKv6-vXMzSaA))

* Current economy follows linear model: products made -> discarded -> landfilled/incinerated/seldom recycled
* Need to reassess design approach
* Various barriers exist
  1. Sorting materials (including different types of plastic)
  2. Virgin plastics are both perceived to be higher quality by the consumer and proven to be higher quality in various journals
* Requirements exists
  1. Preferably exothermic (process releases energy)
  2. Possibly different payment system? Company retains ownership of sold product for easier reuse?

Charlotte ([Charlotte](https://charlottenc.gov/SWS/CircularCharlotte/Documents/Circular%20Charlotte_Towards%20a%20zero%20waste%20and%20inclusive%20city%20-%20full%20report.pdf))

* Extremely limited plastic recycling as of now (3029/144403 tons)
* Also extremely limited composting of organic wastes (31% of total MSW is compostable)
* Circularity will create more jobs and lower unemployment, but there are infrastructure gaps (cannot recycle some objects in Charlotte like most glass) and product design limitations (not designed for high-value reuse)
* Would also save oil use and save money on oil

Wood Plastic Composites Research ([Here](https://www.researchgate.net/publication/261364830_Influence_of_Impact_Modifier_and_Coupling_Agent_on_Impact_Strength_of_Wood_FlourRecycled_Plastic_Composites) and [here](https://bioresources.cnr.ncsu.edu/resources/method-for-limiting-waste-in-wood-plastic-composite-post-production-by-means-of-press-unit-control-parameters-utilizing-temperature-related-dimensional-changes/))

* Possible application of recycled polypropylene
* However, virgin plastics tend to have stronger properties such as impact strength
* Modifiers may be used to enhance strengths to virgin levels