Fact Sheet: Deposit Return Systems Reduce Litter

- **Attaching a monetary value to beverage containers, in the form of refundable deposits, decreases the likelihood that the containers will be littered or remain as litter in the environment.**
- **The impact of a DRS on litter reduction depends on a number of factors, including the level of the deposit/refund and the program scope.**
- **There are different ways to measure beverage containers as a proportion of litter, each of which has its own advantages and pitfalls.**

In addition to increasing recycling rates, one of the main benefits of deposit return schemes (DRS)—and one that cannot be accomplished without it—is litter reduction. Quite simply, this is because attaching a monetary value to a beverage container, in the form of a refundable deposit, decreases the likelihood that the containers will be littered or remain as litter in the environment, as consumers and other citizens will be motivated to return them for recycling so that they can claim the refund.

It probably does not come as a surprise then that litter concerns were a primary reason why legislated DRSs were invented and passed in the first place. The first legislated system, established in British Columbia in 1970, began as "The Litter Act" and was aimed at encouraging consumers to recycle beverage cans and bottles instead of tossing them to the side of the road. Many other DRSs introduced in the 1970s and 1980s were also mainly passed as anti-litter laws, including those in South Australia, Oregon, Vermont, and California.

In New South Wales (NSW), Australia, the state government identified DRS as one of the key actions it's taking to achieve the objectives in the 2019-2022 NSW Litter Prevention Strategy.[i] Moreover, the state's decision to implement DRS in 2017 was principally based on the results of a cost-benefit analysis where benefits to communities from litter reduction were estimated using their willingness to pay for decreased litter.[ii] The discussion document for the DRS decision stated that "by providing a reward, [DRSs] create a disincentive to litter and an incentive to pick up littered items."[iii] Similarly, Queensland's DRS legislation includes in its objectives to "reduce the number of empty beverage containers that are littered or disposed to landfill."[iv] The Tasmanian government's recent decision to implement a DRS (planned for 2022) was also influenced by its effectiveness at reducing littering behaviour; Environment Minister Elise Archer has stated that "the scheme will encourage positive, incentivised recycling and re-use behaviours that will help reach our target of becoming the tidiest state by 2023."[v]

The effectiveness of DRS at reducing litter has also been recognized by the European Union. In 2019, the European Parliament and Council passed the Single-Use Plastic Directive, which introduced a wide range of measures to tackle commonly littered plastic that includes a requirement for member states to collect at least 90% of plastic bottles by 2029. The Directive specifically references DRS as one way to achieve this.

We wanted to see what evidence there was for the impact of DRS on litter reduction, so we set off on a task to compile all of the research we could find on the subject. What we found was compelling and offers substantial proof that deposit systems are effective at decreasing litter. The following table summarises the evidence we found. Despite the methodological issues associated

with measuring beverage container litter, we are confident in saying that no other method of collection has proven, in and of itself, to be nearly as effective at reducing litter rates than DRS. As governments around the world consider their options to solve the complex challenges of packaging waste over the coming years, DRS should therefore be front and centre.

Table 1 Summary of Evidence from Pre- and Post-DRS Implementation Litter Surveys

Country	Key Findings	Data Source
United States	CRI's review of pre- and post-DRS litter studies found that the percent of litter reduction in states where studies were conducted fell within a range that varied by only 14 percentage points. When outliers were removed, CRI found that beverage container litter reductions were consistently between 70 and 84%, and total litter had been reduced between 34 and 47%. Summary of findings from individual studies: • Hawaii: 38-53% reduction in beverage container litter • Iowa: 76% reduction in beverage container litter; 39% reduction in overall litter • Maine: 69-77% reduction in beverage container litter; 34-64% reduction in overall litter • Michigan: 84% reduction in beverage container litter; 41% reduction in overall litter • Massachusetts: 30-35% reduction in overall litter • New York: 70-80% reduction in beverage container litter; 30% reduction in overall litter • Oregon: 83% reduction in beverage container litter; 47% reduction in overall litter • Vermont: 76% reduction in beverage container litter; 35% reduction in overall litter	Litter Studies in Bottle Bill States, Container Recycling Institute[vi]
Australia	One year after NSW introduced its DRS, eligible drink container litter volume was down 44%. Between 2013 and 2019, the volume of total NSW litter has also decreased by 48%.	Return and Earn: A billion reasons to celebrate, NSW Environment Protection Authority[vii]
Australia	Prior to the introduction of a DRS in November 2018, beverage containers were the second most littered item in Queensland. One year later, the amount of containers ending up as litter had reduced by more than 35%.	One billion containers returned in first year of scheme, Queensland Government[viii]
Australia	There has been a 54% reduction in beverage container litter since the scheme was launched.	Annual Report 2019-2020, Container Exchange[ix]
Australia	In May 2012 (5 months after Northern Territory introduced its DRS), there was some 39% less beverage container litter than found in November 2011 (before the DRS was introduced), and 46% less litter than May 2011. There was an even greater reduction in beverage related items (e.g. bottle tops, plastic can holders, etc.) – a 52% reduction from November 2011 to May 2012.	Independent Review: The Northern Territory Container Deposit System, Boomerang Alliance[x]
Australia	Since the launch of the scheme, there has been a decrease of 40% in the volume of eligible drinks containers in the ACT litter stream.	ACT Container Deposit Scheme Annual Statutory Report 2018-19, ACT Government

Country	Key Findings	Data Source
		and Exchange for Change[xi]
Australia	Eligible drink containers made up just 2% of litter items in the ACT in 2019-20, a decline of 17.5% on the previous year. While in terms of volume, eligible drink containers in the ACT litter stream decreased by 23% in 2019-20 compared to 2018-19 levels.	KAB Litter Index ACT 2019-20 Report, as cited in ACT Container Deposit Scheme Annual Statutory Report 2019-20, ACT Government and Exchange for Change[xii]
Australia	The proportion of regulated beverage containers in Northern Territory's litter stream decreased from between 5-10% prior to the introduction of the DRS, to 3.1% in the first year of the DRS' operation in 2012, with the proportion of regulated containers averaging 3.1% in the five years of operation of the DRS.	Evaluation of the Operation of the Northern Territory Container Deposit Scheme, Department of Environment and Natural Resources[xiii]
Estonia	Before the introduction of a DRS in Estonia, the composition of litter along roadsides was analysed as part of a clean-up campaign that was organised in 2003. At that time, beverage containers were up to 80% of the litter collected. After DRS was introduced (in 2005), the amount of litter along roadsides decreased significantly. A follow up roadside litter survey that was carried out 2 years after the DRS was implemented showed that the share of beverage containers had dropped below 10% of total litter in Estonia.	Deposit Return Systems for Beverage Containers in the Baltic States, Balcers, O., Brizga, J., and Moora, H.[xiv]
Germany	In Germany, prior to the introduction of the mandatory DRS, single-use beverage containers were estimated to represent about one-fifth (20%) of the total litter volume (in 1998). Approximately 1 to 2 billion single-use beverage containers were littered across the country in 2002. After the introduction of the DRS, littering of beverage containers subject to deposits was reduced to 'almost zero.'	Reuse and Recycling Systems for Selected Beverage Packaging from a Sustainability Perspective, PricewaterhouseCoopers AG WPG[xv]

Table 2 Summary of Evidence from Comparisons of Litter Amounts Between DRS and Non-DRS Jurisdictions

Country	Key Findings	Data Source
United States	On a per capita basis, there was about half as much soda and beer litter in bottle bill states than in non-bottle bill states (2.5 soda and beer litter items per capita in bottle bill states compared to 5.3 soda and beer litter items per capita in non-bottle bill states). In comparison, on a per capita basis, there were 30% fewer pieces all other types of litter in bottle bill states than in non-bottle bill states (112.8 pieces per capita versus 161 pieces per capita). Taking a wider view of the items that constitute deposit-material litter, the study finds the same dynamics at play as found for soda and beer litter only. On a per capita basis, there was substantially less deposit-material litter in bottle bill states than in non-bottle bill states (4.1 litter items per capita in bottle bill states versus 8.5 litter items in non-bottle bill states). When the project team examined differences between other littered items (non-deposit) between states with bottle deposit	2020 National Litter Study, Keep America Beautiful (KAB)[xvi]

Country	Key Findings	Data Source
	legislation and those without such legislation, they found that there was also less non-deposit litter per capita in bottle bill states (111.2 littered items per capita) than in non-bottle bill states (157.8 littered items per capita). The analyses show that the differences found in beverage container deposit litter per capita between bottle bill states and non-bottle bill states are relatively consistent regardless of the definition of a deposit container (about 50% fewer pieces of deposit litter per capita in bottle bill states than in non-bottle bill states). The analyses also showed that the differences in non-deposit material litter between bottle bill states and non-bottle bill states are relatively consistent regardless of the definition of non-deposit material (about 30% fewer pieces of non-deposit litter per capita in bottle bill states than in non-bottle bill states).	
United States	This study compared 2019 International Coastal Cleanup (ICC) data between states with bottle bills with states that do not have bottle bills. Key findings include: • Plastic bottles, glass bottles, and aluminum cans are approximately 2.5 times more frequently littered in Virginia (a state without a bottle bill) than in states with bottle bills. • In Virginia, which doesn't have a bottle bill, bottles and cans accounted for nearly 22% of all litter recorded by volunteers in the 2019 ICC in Virginia. In contrast, in states with bottle bills, bottles and cans accounted for 8.69%, on average, of the total debris recorded. • Plastic bottles: These accounted for 11.49% of all the litter recorded in Virginia. This is higher than in states with bottle bills, where plastic bottles account for 1.99% to 8.27%. On average, states with bottle bills had 3.93% of the litter made up of plastic bottles, compared to 8.64% for the states that do not have a bottle bill. • Beverage cans: Bottle bill states had 0.79% to 5.47% of their litter made up of beverage cans, for an average of 2.51%. In states with no bottle bills, cans accounted for 3.05% to 10.11%, for an average of 5.88% of the litter. In Virginia, they accounted for 6.66% of all recorded litter. • Glass bottles: These accounted for 3.73% of all the litter recorded in Virginia. In bottle bill states, glass bottles accounted for 2.25% of all littered items on average. • In states with bottle bills, bottles and cans consistently were found littered less frequently, and often were not in the Top Ten list produced by ICC data. In Virginia, however, plastic and glass bottles and beverage cans were all in the Top Ten list of litter items in 2019. • In states without bottle bills, plastic bottles averaged about 3rd place in the ICC's Top Ten lists of littered items in those states. In states with bottle bills, they averaged in 6th place. Beverage cans averaged in 5th place for states without bottle bills, and in 10th place for states that have bottle bills. The ranking of glass bottles between deposit and non-deposit states was more similar; 11th in states in bottle bills and 9th in states without bottle bills.	Littered Bottles and Cans: Higher in Virginia Than in States with Bottle Bills, Clean Virginia Waterways of Longwood University[xvii]
Germany, Spain	In 2014, the Ocean Conservancy surveyed beaches in Germany (which has a DRS) and Spain (which does not), and found that the number of drinks containers littered per kilometer was more than 13 times higher in Spain (330 containers/km vs. 24 containers/km).	Have You Got the Bottle? A Modern Deposit Return System for Scotland, Association for the Protection of Rural Scotland (APRS)
Australia	In 2018-2019, beverage container litter represented only 2.9% of litter items in South Australia, where deposits have been mandatory since 1977, compared to 14.2% in Western Australia, whose DRS will launch in	CDL Containers and Plastic Shopping Bags in

Country	Key Findings	Data Source
	October 2020.	the Litter Stream 2018-19 Report, KESAB Environmental Solutions
United States, Australia	In both the US and Australia, the average proportion of beverage containers found in coastal debris surveys in states with a DRS is approximately 40% lower than states without a DRS.	Economic Incentives Reduce Plastic Inputs to the Ocean, Schuyler et al.[xviii]

Endnotes

[i]NSW Government. December 2019. "NSW Litter Prevention Strategy 2019-2022." Accessed 21 August 2020 from https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/litter/19p1753-litter-prevention-strategy.pdf?la=en&hash=37A13D05A443F1532AE98E6306E15BC2EF77C64B
[ii]Sapere Reseach Group. August 2017. "Cost-benefit analysis of a Container Deposit Scheme." Report for the Auckland Council. Accessed 21 August 2020 from http://www.wasteminz.org.nz/wp-content/uploads/2017/12/Container-Deposit-CBA-Report-Final.pdf
[iii]New South Wales Environment Protection Authority (2015) Op cit. p.15, as cited in Sapere Research Group, August 2017, "Cost-benefit analysis of a Container Deposit Scheme." Accessed 21 August 2020 from http://www.wasteminz.org.nz/wp-content/uploads/2017/12/Container-Deposit-CBA-Report-Final.pdf
[iv]Marsden Jacob Associates. April 2018. "Final Report – A Model Framework for a Container Refund Scheme in Tasmania." Report prepared for EPA Tasmania. Accessed 21 August 2020 from https://dpipwe.tas.gov.au/Documents/Marsden%20Jacob%202018%20CRS%20Model%20Framework.pdf
[v]Jarvie, E. 6 June 2019. "Tasmanian government commits to introducing container refund scheme." The Advocate. Accessed 21 August 2020 from https://www.theadvocate.com.au/story/6204281/tasmania-to-implement-container-refund-scheme-by-2022/
[vi]Container Recycling Institute. n.d. "Litter studies in bottle bill states." Bottle Bill Resource Guide. Accessed 2 September 2020 from http://www.bottlebill.org/index.php/benefits-of-bottle-bills/litter-studies-in-bottle-bill-states
[vii]New South Wales Environment Protection Authority. 2 December 2018. "Return and Earn: A billion reasons to celebrate." Accessed 2 September 2020 from https://www.epa.nsw.gov.au/news/media-releases/2018/epamedia181202-return-and-earn-a-billion-reasons-to-celebrate
[viii]Queensland Government. 1 November 2019. "One billion containers returned in first year of scheme." Accessed 2 September 2020 from https://statements.qld.gov.au/statements/88782
[ix]Container Exchange (CoEX). "Annual Report 2019-2020." https://containerexchange.com.au/wp-content/themes/coex160620/annual-report/dist/img/ce-report.pdf
[x]Boomerang Alliance. February 2013. "Independent Review: The Northern Territory Container Deposit System." Accessed 2 September 2020 from http://www.bottlebill.org/assets/pdfs/campaigns/australia/NT%20CDS%20Report%20Final_180213.pdf
[xi]ACT Government and Exchange for Change. "2018-2019 ACT CDS Annual Statutory Report." Accessed from https://www.exchangeforchange.com.au/who-we-are/publications-and-reports.html
[xii]ACT Government and Exchange for Change. "2019-2020 ACT CDS Annual Statutory Report." Accessed from https://www.exchangeforchange.com.au/who-we-are/publications-and-reports.html
[xiii]EY. 20 August 2018. "Evaluation of the Operation of the Northern Territory Container Deposit Scheme." Prepared for the Department of Environment and Natural Resources. Accessed 3 September 2020 from https://ntepa.nt.gov.au/__data/assets/pdf_file/0011/590798/cds_review_report_ernst_young.pdf
[xiv]Balcers, O., Brizga, J., and H. Moora. 2019. "Deposit Return Systems for Beverage Containers in the Baltic States. Riga: Green Liberyt. Accessed 2 September 2020 from https://www.researchgate.net/publication/332242306_Deposit_Return_Systems_for_Beverage_Containers_in_the_Baltic_States_Riga_Green_Liberty
[xv]Cf. Witzenhausen Institut, 2001, p.6 and Cf. SIM, o.J., p.8, as cited in PricewaterhouseCoopers AG WPG. June 2011. "Reuse and Recycling Systems for Selected Beverage Packaging from a Sustainability Perspective: An anslysis of the ecological, economic and social impacts of reuse and recycling systems and approaches to solutions for further development." Accessed 3 September

2020 from https://cooplesvaloristes.ca/v2/wp-content/uploads/2015/04/reuse-and-recycling-systems-for-selected-beverage-packaging-from-a-sustainability-perspective.pdf
[xvi]Keep America Beautiful. May 2021. "2020 National Litter Study – Summary Report." Accessed 14 June 2021 from https://kab.org/litter-study/
[xvii]Register, K. 3 November 2020. "Report: Littered Bottles and Cans: Higher in Virginia Than in States with Bottle Bills." Clean Virginia Waterways of Longwood University. Farmville, VA. Accessed 13 November 2020 from https://drive.google.com/file/d/1wyDpBGJcjUj6uOuddgOuzg_OK3w8lRpW/view
[xviii]Schuyler, Q., Hardesty, B.D., Lawson, TJ., Opie, K., and C. Wilcox. 2018. "Economic incentives reduce plastic inputs to the ocean." Marine Policy, 96, 250-255. Accessed 2 September 2020 from https://doi.org/10.1016/j.marpol.2018.02.009