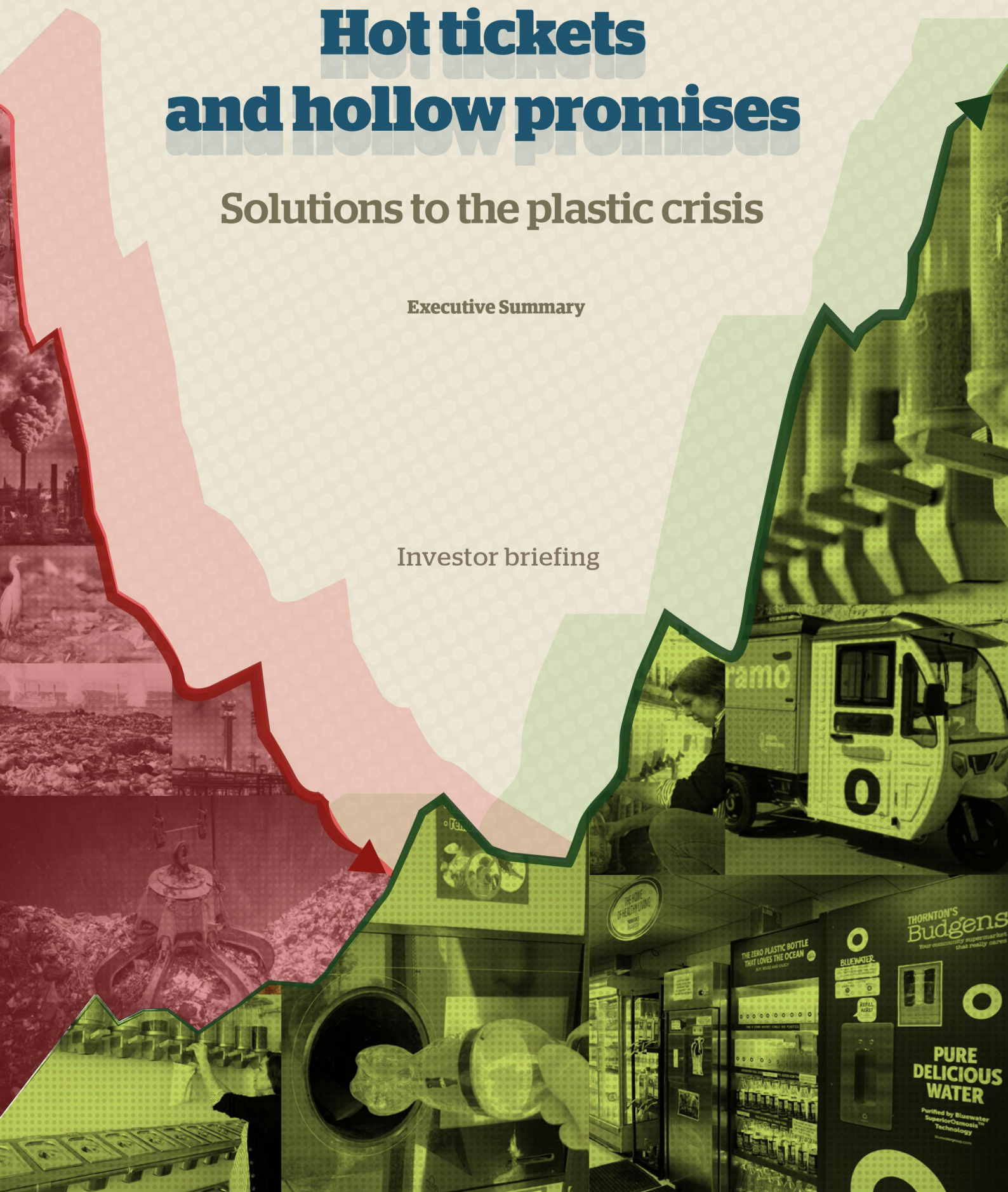


Hot tickets and hollow promises

Solutions to the plastic crisis

Executive Summary

Investor briefing

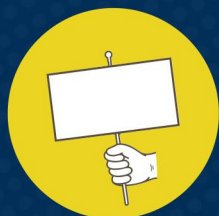


Solutions to the plastics crisis come in many forms. However, not all solutions are created equal, and some are more financially and technically viable than others. A concerning level of attention is still being paid to unproven solutions, while major investment institutions lack a full understanding of the policy landscape and its implications.

The following factors will shape the context of the next decade of investor and corporate response to the plastics crisis:



- **Plastic production and pollution** will continue to skyrocket, creating further public backlash and a high risk of stranded assets.



- **Consumer pressure** will create increased scrutiny on corporate action and a mandate for more comprehensive legislation.



- **Regulation** will become an increasingly dominant market force, shaping which technologies win and fail.

Of the technologies covered in this report, we evaluate that:



- Investors should avoid being drawn in by the hype surrounding **chemical recycling** and should steward those they invest in away from reliance on these technologies, which are highly risky and potentially unviable.



- Solutions related to **separate collection and sorting technologies** are a unique opportunity for investment in the short-to-medium term, because regulation indicates they will experience rapid growth.



- Solutions aimed at scaling **reuse and refill** represent a suite of answers to the plastics crisis. Regulations such as all-in deposit-return systems also favour refill enterprises and pave the way for new business opportunities.

Setting the context

Three core trends will shape the operating conditions of the investor response to the plastics crisis in the next decade:

1. Plastic overload + carbon intensity = stranded assets

Plastic production is set to skyrocket; by 2040, the amount of plastic leaking into the environment is set to triple.¹ This will give rise to louder calls to address the problem upstream – either by imposing restrictions on production (such as bans) or by favouring upstream solutions like separate collection, reuse and refill.

Fossil-fuel giants pinning their hopes of future revenue on expanding petrochemical production (a category that includes plastic polymers for uses such as packaging and synthetic fibres)^A defy concerns from every corner of society, as well as governments' decarbonisation agendas, which runs a high risk of stranded assets.

2. Growing consumer pressure will create a mandate for action

With plastic pollution likely to get worse before it gets better, we can expect societal calls for systemic action to become louder. At present, 87% of citizens in the EU are worried about the impact of plastic production on the environment, while 74% are worried about its impact on their health.² This pressure creates a mandate for stronger legislation from policymakers, and will push companies with large plastic footprints to adopt ambitious targets on reuse, plastic reduction, collection and recycled content.

3. Regulation will become an increasingly dominant market force

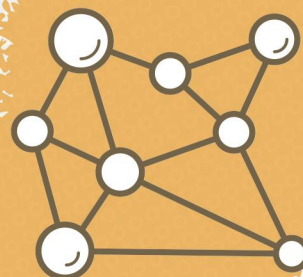
Over the past 20 years, there has been a clear upward trend in both the number of regulatory policies on plastic and their comprehensiveness;³ 25% of policies launched between 2000 and 2005 were comprehensive, compared to 59% in 2018 alone. Such policies increasingly use a combination of binding regulation – both prohibitive (such as plastic-bag bans) and affirmative (such as improvements to infrastructure) – and economic instruments (such as deposit-return systems, extended producer-responsibility schemes and taxes). Good examples of such policies are the EU's Single-Use Plastics Directive and its Waste Directives.

From China's landmark National Sword Policy in 2018 – which upended the waste trade, allowing countries to ship their plastic rubbish to low- and middle-income countries – to the Basel Convention's recent entry into force, restrictions on exports mean plastic waste is piling up within countries, increasing the pressure for it to be dealt with domestically. This means countries will quickly be confronted with the need to rapidly scale separate collection, mechanical-recycling capacity and plastic-waste reduction strategies, such as reuse policies and restrictions on certain (non-recyclable) products and materials. Recent trends, in which recycled PET prices overtook virgin PET prices, makes the case for increasing recycling capacity even stronger.

This unique combination of factors will set the operating context of technologies billeted as tackling plastic pollution.

A According to a study by Pew Charitable Trusts, on its current trajectory, plastic production could use up 19% of our remaining carbon budget. Pew Charitable Trusts (2020) *Breaking the plastic wave* [ONLINE] Available at: https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf

Available technologies and recommendations to investors



Chemical recycling

High risk, short-to-medium term

Our analysis finds significant risk exposure for chemical recycling – a suite of technologies ranging from turning plastic into fuel to be burnt to attempts to break down, then reassemble, the molecular building blocks of plastic – from technical and financial viability problems to its dubious environmental performance.

Environmental performance

Chemical recycling is both an energy- and carbon-intensive process, requiring large amounts of external energy input, even when burning some part of the feedstock is accounted for.⁴ To date, there is no comprehensive, independent life-cycle assessment of chemical recycling. With future clampdowns on emissions from all sectors likely, investors should opt for recycling technologies less liable to restrictions in this regard, such as mechanical recycling.⁵

There is also ample evidence that pyrolysis and gasification do not filter out harmful contaminants present in plastic – such as bisphenol A, cadmium, benzene, brominated compounds, phthalates and antimony – and that these processes add further toxic compounds into the mix. The cost of phasing out toxic chemicals is prohibitive, adding to the financial viability issues the technology faces.

Technological and financial viability

The high energy costs and immature technology of chemical recycling mean the vast majority of projects are ‘dead in the water’⁶, even after decades of development. Technologies such as pyrolysis and gasification produce low yields and have persistent problems with contamination, while depolymerisation technologies are still only lab-scale, with none able to compete commercially. High-profile failures – such as the drubbing of Loop Industries in 2020, which was backed by companies such as Coca-Cola, Danone and PepsiCo but experienced a significant share-price drop after its lack of viability was exposed⁷ – should serve as a warning to investors of the hollow promise of chemical recycling.

Investor recommendation

Investors should avoid being drawn in by the hype surrounding chemical recycling, and should steward those they invest in away from reliance on this technology. Although there may be a niche role for depolymerisation in the long term, most technologies in the ‘chemical recycling’ arena are exposed to a number of risks, and are unlikely to bring returns in the short term.

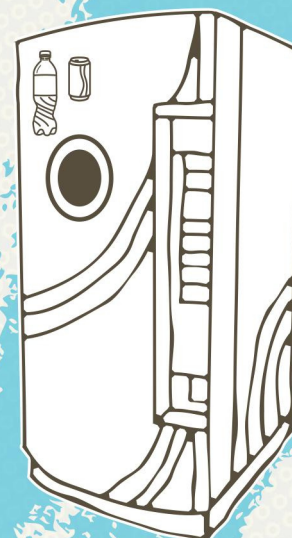
Separate collection

High opportunity, short term

Analysis by the Container Recycling Institute suggests that over a billion people will live in jurisdictions with deposit-return systems^B (DRS) in place by 2030 - up from nearly 300 million people in 2017.⁸ This is driven by governments' growing realisation that DRS are the only way to achieve 90%+ return rates of beverage containers,⁹ with the potential to expand to other types of packaging making them a win-win-win opportunity to reduce littering, increase separate collection rates and guarantee clean streams of recyclable materials. Our assessment of the regulatory landscape is that the growth in container-deposit legislation and minimum recycled-content obligations, and a resulting increase in mechanical recycling, is creating the ideal conditions for companies with reverse vending machine technology, optical sorting and washing facilities, and mechanical-recycling infrastructure.

Our modelling indicates that the progress of container-deposit legislation will lead to growth in the global reverse vending machine market of over 8.4× by 2029, from 84,100 installed machines in 2019 to a potential of 705,257 installed machines in 2029. For this report, we also analysed the growth potential of TOMRA, the market leader in reverse vending machines. From 2021 onward, we expect a four-year 20%+ CAGR for the company, with our models discounting market share by 10% due to increased competition in a maturing market.

Separate collection dovetails neatly with the low-risk, proven technologies in mechanical recycling, which have a strong track record. This allows easier scaling up and building out of additional infrastructure in other parts of the world. Adding carbon pricing when replacing virgin plastics with recycled content will create a further pull market.



Investor recommendation

Investors should consider companies in this space a high-growth opportunity in the short-to-medium term. Market leader TOMRA is a rare and welcome find, exhibiting steady growth and stable margins, while other innovators in the space should also be considered.

^B DRS are a highly effective mechanism for collecting large volumes of empty containers in clean waste streams for use in high-quality recycling, or for setting up refill-or-reuse systems. Containers are sold with a small deposit fee, which is refundable upon return of the container to a store or collection point. For more information, see: https://talking-trash.com/wp-content/uploads/2020/08/TalkingTrash_2_DRSExplained.pdf

Reuse and refill

Good opportunity, both short term and long term

Separate collection and recycling alone will not be enough to solve the plastics crisis, and societal and regulatory pressure is pushing for upstream solutions that reduce our reliance on plastic at source. Refillable containers can be used several times before they are recycled, eliminating the need to manufacture new containers and avoiding many of the environmental impacts associated with both production and waste management.¹⁰ While global data shows a steady decline in refillables, a shift towards both voluntary and mandatory reuse-and-refill quotas is underway, stimulated by societal pressure, investor interest and changes in consumer behaviour. According to the Ellen MacArthur Foundation, this represents an opportunity worth \$10 billion if 20% of single-use plastics are replaced with refillable alternatives.¹¹ Crucially, legislation will also revolutionise reuse and refill. Not only does DRS provide the system to underpin refill systems but reuse-and-refill quotas and policies – such as those adopted in France, parts of Spain and Romania – create further incentives.



There are very good examples of re-usable packaging, like plastic beverages crates, crates for fruit and vegetables, and bulk containers. The majority of such products are made with mono materials which allows 1:1 recycling back into the same applications. The use of refillable bottles in combination with reuseable beverage crates has long existed and now has opportunities in new and developing markets.

In the US, the example of the Oregon Beverage Recycling Cooperative, which has built a successful refillables business model on the state's DRS, shows how DRS is a critical enabling policy to establish such business opportunities. The more regulation continues on this trajectory, the more such opportunities we can expect to arise across the world. In Germany, the German Wells Cooperative has established an economically and environmentally effective pool-reuse system for mineral water, whereby standardised packaging is shared across the system – preventing 5 billion single-use bottles being used each year. Also in Germany, the Hassia Group has invested in bottle washing, optimised its processing infrastructure and increased the outputs of its refill system without compromising on environmental impact – all enabled by the country's best-in-class deposit system.

Promising opportunities and disruptive innovations across packaged goods, food-to-go, beverages and logistics show the breadth of the market's potential for growth. This should be a key area of interest for investors, particularly those looking for equity opportunities.

Investor recommendation

Investors with a view to medium-to-longer-term opportunity should closely watch developments in the reuse-and-refill space, particularly for equity openings. Considered the environmental holy grail, promising reuse-and-refill ventures are still flying under the radar of most investors, but – with increasing pressure on policymakers to enshrine reuse in legislation, and with consumer brands under scrutiny to adopt such systems at scale – investors find themselves in a position to shepherd in a refill revolution in how we consume. With the shift towards all-in DRS, which enable refill at scale, the opportunity for new businesses will only grow stronger.

Conclusion

The findings of our full investor briefing outline in more detail the operating context for investors and businesses in response to the plastics crisis over the next decade. The wider landscape trends are of continued – and even mounting – societal pressure to stem the flow of plastic into the environment, with an increasing focus on upstream solutions. The response from policymakers and government leaders is already taking shape, with more comprehensive policies growing in number and scope. This, in turn, dictates the sorts of solution technologies that will sail or flop in the coming years as businesses, municipalities and investors adapt to the regulatory environment.

Our analysis finds chemical recycling to be exposed to high regulatory and operational risk; separate collection and sorting technologies – particularly reverse vending machine suppliers – to be a welcome opportunity; and businesses specialising in reuse and refill to provide good short-term prospects and longer-term equity opportunities.

Disclaimer

This research is provided for informational purposes only and should not be considered as investment advice. Views in this report should under no circumstances be considered as an offer to sell, or a solicitation of an offer to purchase or sell any relevant financial instruments.

Reasonable care has been taken to ensure that the contents of this research report are not untrue or misleading; however, no representation is made as to its accuracy or completeness. The Changing Markets Foundation and its affiliates accept no liability whatsoever for any direct or consequential loss - including, without limitation, any loss of profits - arising from reliance on this research report.

All views expressed herein are the opinions of the research analysts and subject to change, and the Changing Markets Foundation does not undertake action to notify any recipient of this research report of any such change, nor of any other changes related to the information provided in the research report.

www.changingmarkets.org

Design: Pietro Bruni - toshi.ltd

Published: September 2021



References

- 1 Pew Charitable Trusts (2020) Breaking the plastic wave [ONLINE] Available at: https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf
- 2 Special Eurobarometer 468: Attitudes of European citizens towards the environment. Quoted in Rethink Plastic Alliance (2019) Moving away from single-use: Guide for national decision-makers to implement the Single-Use Plastics Directive [ONLINE] Available at: https://rethinkplasticalliance.eu/wp-content/uploads/2019/10/2019_10_10_rpa_bffp_sup_guide.pdf
- 3 Duke University Nicholas Institute (2020) 20 years of government responses to the global plastic pollution problem [ONLINE] Available at: https://nicholasinstitute.duke.edu/sites/default/files/publications/20-Years-of-Government-Responses-to-the-Global-Plastic-Pollution-Problem_final_reduced.pdf
- 4 Baytekin, B., Baytekin, H.T. and Grzybowski, B.A. (2013) Retrieving and converting energy from polymers: Deployable technologies and emerging concepts. *Energy and Environmental Science*, 6: 3467–3482.
- 5 Levidow, L. and Raman, S. (2019) Metamorphosing waste as a resource: Scaling waste management by ecomodernist terms. *Geoforum*, 98: 108–122
- 6 Goldsberry, C. (2021) Chemical recycling is no silver bullet for eliminating plastic waste. *Plastics Today*, 13 February [ONLINE] Available at: <https://www.plasticstoday.com/packaging/chemical-recycling-no-silver-bullet-eliminating-plastic-waste>
- 7 Fox, M. (2020) Loop Industries plummets 39% after a short-seller report claims its plastic-recycling technology doesn't work. *Business Insider*, 10 October. [ONLINE] Available at: <https://markets.businessinsider.com/news/stocks/loop-stock-price-falls-after-short-seller-technology-doesnt-work-2020-10-1029674994>
- 8 Collins, S. (2020) International embrace. *Plastics Recycling Update*, Winter [ONLINE] Available at: <http://www.container-recycling.org/images/stories/PDF/International%20Embrace%20Update%20Winter%202020.pdf>
- 9 Reloop (2018). Deposit systems for one-way beverage containers: Global overview 2018 [ONLINE] Available at: <https://www.reloopplatform.org/wp-content/uploads/2018/05/BOOK-Deposit-Global-27-APR2018.pdf>
- 10 Changing Markets (2021) Talking trash: The corporate playbook of false solutions to the plastics crisis. [ONLINE] Available at: http://changingmarkets.org/wp-content/uploads/2021/01/Talking-Trash_FullVersion.pdf
- 11 Reloop (2020) From Single-Use to Multi-Use: Seizing the Opportunity in the EU's Single Use Plastics Directive [ONLINE] Available at: <https://www.reloopplatform.org/from-single-use-to-multi-use-seizing-the-opportunity-in-the-eus-single-use-plastics-directive-by-samantha-millette-and-clarissa-morawski/>