THE WINSTON CHURCHILL MEMORIAL TRUST OF AUSTRALIA

Report by Helen Millicer 2017 Churchill Fellow

To study circular economy and plastics recycling

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3 September 2018

For James Maude, my partner in life and discovery.
For beloved Albert Hempel and his vision for a sustainable planet (1971-2017).

Keywords: Circular Economy; Plastics; Recycling; Marine Litter; China's Ban; Plastic bags; public procurement; plastics manufacturing; carbon emissions; Australia.

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NOTE: At the time of undertaking the Churchill Fellowship and writing this report I held these roles. This report presents my own observations and assessments of directions for Australia, and not the views of these organisations (2-4).

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I was humbled by your command of English and my paltry vocabulary in your native languages. I treasured our time together and hope I was a worthy ambassador for Australia. I look forward to continuing our correspondence and collaborations. You are most welcome to journey here to our wonderful country in exchange.

As to the future, we must succeed in the giant task ahead, namely to shift our economy and systems through innovation and collaboration. Our future of a more circular and sustainable economy and environment depends upon us addressing the twin interrelated parts: managing plastics and greenhouse gas emissions. This is the key challenge and opportunity for us in the next decade for a better 21st century.

Figure 1 Cover photo: James Maude, Helen Millicer and Howard Waghorn, Hahn Plastics UK

CONTENTS

1.1 Terms and clarifications iii

Executive Summary 1

Recommendations arising from this research project 3

2 Introduction 6

2.1 The need, and discovering the solution 6

2.1.1 High risk, pollution and China 7

2.1.2 Plastic packaging and products 7

2.1.3 This focus of this report 7

2.1.4 Sharing the results 8

2.2 My Churchill Project Summary (prepared in November 2017) 9

2.3 Tour Itinerary 10

3 Building blocks for a more Circular Economy for Plastics 11

4 European Strategies and Plastics 14

4.1 EU Commission, Directorate General Environment 14

4.1.1 Single use plastics and marine litter 16

4.1.2 EU Ecolabel for high environmental performance and procurement programs 17

4.2 Professional and Advocacy Organisations in EU 19

4.2.1 EU Plastics Converters (EuPC) 19

4.2.2 European Plastics Recyclers (PRE) (Plastics Manufacturer) 20

4.2.3 EuCertPlast 21

4.2.4 Plastics Europe 22

4.2.5 VinylPlus 24

4.2.6 Recovinyl 26

4.2.7 EU Manufacturers Expanded Polystyrene Association (EPSMA) 26

4.2.8 World Wide Fund for Nature (WWF) 27

4.2.9 Confederation of European Waste to Energy Plants (CEWEP) (incinerators) 28

4.2.10 EPEA Internationale Umweltforschung - *Cradle to Cradle* and *The Upcycle* 29

5 Netherlands 31

5.1 Netherlands Circular Economy strategy 31

5.1.1 Circular Economy Engagement and Procurement 32

5.1.2 Landfills and recycling 32

5.1.3 Packaging collections 33

5.2 Dutch Energy supply and demand 35

5.2.1 AEB Incinerator, Amsterdam 36

5.3 Plastic Reprocessor – Van Werven 37

6 Germany 39

6.1 Circular Economy Strategy 39

6.2 Hamburg Chamber of Commerce (Handelskammer Hamburg) 40

6.3 Bestsort (Buhck Umweltservices, part of the Buhck Gruppe) 41

6.4 Public Drop-Off Facility, Nymphenburg. Abfallwirtschaftsbetreib Munchen 42

7 Belgium 45
7.1 Fost Plus – Packaging organisation and collections 45
7.2 EXPRA (Extended Producer Responsibility Alliance) 47
8 England and UK 48
8.1 Circular Economy Strategy 48
8.2 WRAP UK (Waste & Resources Action Programme) 50
8.3 Manchester Region 52
9 SE Asia 56
10 Malaysia 57
10.1 Malaysian Investment Development Authority, Kuala Lumpur 57
10.2 Heng Hiap = Plas haus, Pasir Gudang, Johor Province, Malaysia 59
11 Thailand 61
11.1 All Product Recycling and Golden Dragon Industrial Park 61
12 Events 63
12.1 Plastic Recycling Show Europe, Amsterdam 24-25 April, 2018 63
12.1.1 Introduction (4 speakers plus official opening): 63
12.1.2 PET 63
12.1.3 PVC 64
12.1.4 LDPE 64
12.1.5 HDPE 64
12.1.6 Awards Ceremony 65
12.2 IFAT Munich, Mon 14- Wed 16 May. 66
12.3 Manchester Circular Economy Club, 17 May 67

1.1 TERMS AND CLARIFICATIONS

There are some terms used in this report that require clarification. For example, I seldom use the terms 'recycler', 'waste' or 'waste to energy' which are umbrella terms and often misused, preferring more precise terms such as sorter or collector, incinerator or anaerobic digestor, for example.

Anaerobic digestor	An enclosed vessel that receives organic material and captures the outputs from the fermentation process to produce heat, gas and liquid for energy and soil fertilizer. Sometimes grouped under umbrella term of 'Waste to Energy'
Bio-plastics	Generally refers to plastics created out of non-oil derived materials, ie plants
Bio-degradable	Generally refers to material that degrades in the environment. This is contentious for plastics as to the conditions required for degradation to occur, ie industrial scale compost or marine environments
Brand Owner	The owner of the brand, and in many complex products such as TVs, there are many manufacturing suppliers of the parts that make up the finished branded product. Brand owners are the designated contributors to Product Stewardship Schemes as they are responsible for sales into the market.
Circular Economy	See Section 3 for diagram and explanation
Collector	A person or organization that collects products or packaging from kerbside bins, businesses, public places and delivers them to a designated site such as a sorting facility or landfill
Compounder	A processor who mixes raw materials to make batches of material with distinct special characteristics, such as adding colour and plasticisers to customer specifications
EPR	Extended producer responsibility
HDPE	High-density polyethylene
Incinerator	A facility that receives material for combustion. Efficiency and pollution depends upon material deposited in the furnace and investment in the process and flues. Sometimes grouped under umbrella term of 'Waste to Energy'
Landfill	Sites where material is deposited and buried. They can be licensed by government or not, and best practice landfills are lined, covered and feature methane capture to minimize negative impact on the environment
LDPE	Low-density polyethylene
Manufacturer	A company producing semi-finished or finished goods for sale to a customer
Municipal solid waste	Waste produced primarily by households and council facilities.
PET	polyethylene terephthalate
PP	polypropylene
Product stewardship	A policy approach recognising that manufacturers, importers, governments and consumers have a shared responsibility for the environmental impacts of a product throughout its full life cycle. Product stewardship schemes establish a means for relevant parties in the product chain to share responsibility for the products they produce, handle, purchase, use and discard.
PS	polystyrene
PVC	polyvinyl chloride
Recyclate	Plastic material that has been reprocessed and is available to the market as a substitute for another material or virgin plastic polymer
Recycler / Recycling	A broad term for the person or act of contributing to recycling. Everyone can claim to be a 'recycler'. Often confused with 'collectors' and 'sorters'.
Reprocessor	An organisation that applies a process to change an existing product or material, such as shredding, washing, pelletising to prepare it for beneficial use
Resource	Whether virgin or recycled, resources are materials that have a value and can be used in some way, such as in manufactured product
Sorter	Someone who sorts products or packaging by hand or machine. In Australia most kerbside packaging recyclable material is sorted by a system of conveyors, sieves, magnets etc to separate the metals, plastics, paper and

	cardboard, etc. In parts of Europe where residents separate at home, the sorting facilities reach higher levels of quality separated materials.
Supply chain	A term that describes the suppliers involved in the whole life cycle of a product, from raw material supplier such as gas producer to manufacturer of the plastic, compounders, freight companies, to retail stores, to product user, and then post-consumer to the collector, sorter, landfill or reprocessor for a second life.
Waste	The term 'waste' is often confusingly used to describe materials or products that are unwanted or have been discarded, rejected or abandoned, and which also includes products and materials that can be reused and recycled. In this report I refer to 'waste' as residual material that goes to landfill. If it has a beneficial reuse or value I call it a 'resource' or 'material'.
Waste Hierarchy	See Section 3 for diagram and explanation
Waste to Energy (W2E)	Another umbrella term, like 'Recycler', refers to facilities that use material to generate energy. This may include organic (food and garden) material in an anaerobic digestor or waste incinerator.

I certainly saw some outstanding achievements in my travels and gained insights useful for Australia. I also saw areas in which Australia leads other nations, such as less single use plastics and less cigarette butt litter.

Figure 2 Single use plastics in EU:
IFAT Munich: three plastic items to make one tea, and Brussel's hotel: plastic cup in plastic bag on a doily. But reuse towels to save the environment!

Executive Summary

This Churchill Trust tour has shown that the world is shifting to a more circular material economy, and that Australia has to adapt its systems to be competitive in this new world order. Europe, and especially Netherlands and Germany, are building upon their strong foundations for even higher recycling rates for many materials, including plastics.

Australia has some of the essential building blocks, and needs many more. Also some of our building blocks, such as kerbside collections and product stewardship schemes, must improve if we are going to withstand China's bans, maintain recycling rates and have a more productive economy. We are at a critical turning point where our policies, decisions and investments need to be informed by overseas experiences, on matters from incineration to progressive bans and incentives.

During this tour it became clear that in relation to use, recycling and circularity of all plastics, Australia performs poorly, with high use and low reprocessing at ~12%, whereas countries such as Netherlands and UK reach 33%, and Germany 38%. Australia is at risk of seeing it's already low recycling rates plummet, larger quantities going to landfill and starving its manufacturers of quality recyclate. If the latter happens Australia will enter into a viscous cycle of lower recycling rates and economic insecurity.

The key pivot point in the trip was learning that China introduced its bans in 2017 with the encouragement of the European plastics recycling organisations for adoption of European standards on sorted bales and recyclates. I learned that the Europeans took this strategic step to ensure that they could lift standards and shift the EU to a more circular and powerful economy, less dependent upon natural resources from outside EU. Together EU and China have re-orientated global trade and standards. These actions indicate the directions for our materials economy.

I learned that Circular Economy Strategies are being developed and adopted in Netherlands and Germany as new whole-of-government and industry policies. For these countries it forms part of their national strategy for economic security and independence with continued jobs and prosperity alongside environmental and greenhouse gas emission reduction targets.

For these reasons, there is almost universal support for the circular economy and plastics strategies and the programs, and the widespread adoption and replication by many organisations, including those that might normally be at loggerheads:

- EU, National, state and local governments
- Peak industry groups such as Plastics Europe, European Plastics Recyclers, VinylPlus
- Hamburg Chamber of Commerce
- Product Stewardship schemes such as Fost Plus in Belgium and Afvalfonds in Netherlands
- Environmental groups such as World Wildlife Fund for Nature.

In Netherlands and Germany it is well understood that the waste market is artificial, and that it requires regulation and measures to ensure that everything is not sent to landfill. Waste like water flows to the lowest point, and so they design policy and program levers to lift material to higher value.

I saw how the focus and actions are shifting from *waste* and *quantity* toward *durability, quality then quantity* to meet end market requirements, and how this has stimulated enthusiasm and investment by the private sector and governments. Far from acting as a drain, in Europe and SE Asia, the EU Circular Economy Strategies and China's bans have accelerated action on sorting, reprocessing, measurement systems, quality assurance and lifted professional standards and accountability.

The scale of change is also being achieved by sophisticated collaboration between governments and industry groups. These take various forms including joint ventures and co-funded multi-year projects (that are buttressed by legislation, regulation, bans and other measures and incentives).

The impressive building blocks that contribute to a more circular economy and were the highlights of my tour included:

- EU Commission's Plastics Circular Economy Strategy and spin off actions, especially their requirement upon industry and governments to pledge and present strategies in 2018 to *reprocess* 10 million tonnes plastics by 2025 (up from current 3 million tonnes)
- Progressively high recycling targets for plastics and other valuable materials such as organics
- Highly separated material streams that maintain quality of material, for example high-recycling countries separate glass from cardboard and plastics in residential collections
- Netherland's innovative approach of a suite of packaging entities around Afvalfonds, ensures all parties and responsibilities are covered and coordinated delivering high recycling rates
- Netherlands Government's continuous improvement has created the foundations for very high recycling rates. These include legislating the Waste Hierarchy, forming their Circular Economy Strategy and actions, in particular their Procurement program and approach for 'Best Value' and Green Deal partnerships
- Van Werven Plastics Reprocessor, Netherlands now in four countries, sorts almost Australia's total recovered plastics each year (120,000 tonnes of *rigid* plastics) to 25 types for sale as quality pelletised material as substitute for virgin
- Axion Plastics partnered with S Norton and WRAP UK for recovery of quality industrial plastics from end of life vehicles for sale to customers and the high value market
- EU EcoLabel has over 60,000 listed products that meet EU standards for procurement
- State City of Hamburg's Green Procurement Guidelines provide clarity and good incentive
- EU CertPlast's certification standard for plastics recycling and reprocessing facilities is going global
- VinylPlus and RecoVinyl is a global model. They have lifted PVC recycling from 18,000 tonnes to 639,000 tonnes in 13 years, and involved experts in forming recovery and reprocessing schemes for durable products like flooring and windows
- City of Munich's easily accessed local drop off facilities are free resulting in minimal dumping and litter and have high level sorting direct into containers by the public (minimal handling)
- Environmental groups are planning a global campaign for Plastic-free Oceans starting Sept-Oct 2018 that will include a requirement that plastics producers pay for clean up
- EU Commission's announcement on Marine Litter in May 2018 listed tailored actions for 10 items, mainly plastics, and proposal for global agreements
- Vietnam, Thailand and other countries announcing bans, like China, to control pollution.

There is no doubt that the global material tectonic plates are moving. The 20th century saw the invention and proliferation of plastics. While we continue to see a rise in plastics use, we are on a new path in the 21st century, toward more resilient circular economies away from linear systems of 'take, make and dispose', and countries are seeking to reinforce local manufacturing and jobs with local and/or imported quality plastics recyclate. The tide will turn to more durable and less short life plastics.

China may have banned low quality imports, but it is hungry for quality material, as is Europe, Malaysia and Thailand. This has been evident with metals and rare earths for some time, and it is now arising with quality plastics. This is being driven by the risks around manipulated feedstocks (oil, gas and bio-material), the cost of pollution and countries pursuing economic security and independence.

Globally we also now recognise that plastics are both fantastic, essential, and fatal. And so for the next few years and decades the negative impacts of plastic will be addressed by a range of measures ranging from bans, to material substitution, levies and formation of more recovery schemes, like RecoVinyl. The industries can embrace or delay, but the tide has turned toward accountability and quality to ensure we move to a more circular and sustainable economy.

RECOMMENDATIONS ARISING FROM THIS RESEARCH PROJECT

Australia has the necessary ingredients to improve its recycling, of plastics in particular, and to shift to a more circular economy. While it is a very large continent with a highly distributed population, it is one nation with one shared language, relatively consistent laws, regulations, communications, media and pricing systems.

Our governments, industry and communities are relatively affluent with capacity to invest and grow upon established and trusted organisations, governance and management systems. Australians are also relatively well educated, law-abiding, active citizens in democracy and adopting innovative practices, concerned about their environment and keen on innovation and recycling.

This is a high-level list of key recommendations arising from my observations from the Churchill Scholarship tour. There is more detail in thinking behind these recommendations.

Strategies and policies

1. Australian Government, state and local governments enshrine the Waste Hierarchy in policies and investigate forming regulations or legislation to support widespread use
2. Australian Government and state governments develop Circular Economy Strategies, making important shifts away from existing 'Waste' Strategies, including forming targets, forward plans and actions that integrate jobs and economic outcomes as well as carbon and environmental measures for improved productivity in Australia
3. Australian Government engage with the EU, G20 and industry on the subject of improving the cost effectiveness of recycling, and increasing the cost of raw resin material to raise funds to cover the cost of externalities of plastics and to improve the viability of plastics recovery
4. Australian Government, state and local governments develop and adopt Green Procurement Guidelines that support the nation and our companies to become leaders in circular economy in Asia/Pacific. The range of measures could include: preference for brands/companies that participate in product stewardship schemes, comply with EcoLabels, have recycled content, low environmental impact, are repairable and recyclable
5. Governments collaborate with industry sectors on specific industry sector circular economy strategies, in particular plastics, building and construction, and manufacturing
6. A Plastics Circular Economy Strategy is formed involving the plastic sector to address packaging and durable plastics, potential certification standards, labelling, procurement, product stewardship and collections, supply chain strengths and weaknesses, litter, bans of certain items, funding mechanisms to address litter and recovery/reprocessing schemes, etc
7. The federal and state governments produce Marine and Environmental Litter policies and strategies identifying the cost and benefit of actions
8. Industry and environment organisations form similar Circular Economy Strategies and programs with members, supply chains and communities, deliver training and conference programs on circular economy principles and leadership for strong industry and environment in Australia

Product Stewardship and Procurement for market pull and waste minimisation

9. The federal Product Stewardship Act is currently under review, and measures need to be put in place to make it easier for new Schemes to be established and successful in recovery and circularity of the products, this may include enabling appropriate measures at landfill, differential pricing and procurement

10. Existing and future Product Stewardship Schemes are to include responsibility and financial contributions to more than just collections, namely also including reprocessing, innovation, repair-ability and circularity, such as new business models of renting and return for repair and reuse. They are also to advise customers of the impact of their products on the environment and recovery schemes.
11. Governments should establish partnerships with industry with multi-year funding to establish specific collection and reprocessing programs for durable products/materials that have end markets in Australia, such as pipe, EPS insulation and packaging, and that measures are then developed that support the long term operation of these circular schemes, such as differential pricing at landfills or bans.
12. The Australian Packaging Covenant Organisation should extend its responsibility to adopt a wholistic lifecycle approach to packaging that supports innovation, collection trials, differential member fees, procurement and recycled content standards for lower impact and improved circularity
13. Local councils, key industry peak bodies and their members, and environment groups are also encouraged to adopt Green Procurement Guidelines (as Recommendation 4) to support Australia and our companies becoming leaders in circular economy in Asia/Pacific.

Close the Loop with quality recovered material and standards for facilities

14. That financial mechanisms, whether government funding, loans or levies shift to support projects that find solutions with products/materials that have end markets or develop local end markets. There are many manufacturers, not only of plastics products, that are unable to source sufficient quality or quantity recycled material as a substitute for virgin material. Too few programs support reprocessing, new collections and end markets for plastic packaging and action is urgently required to address durable plastics.
15. Plastics are a complex supply chain and far more research and studies need to be done with industry into the supply chains, different polymers, their applications and reuses, existing and undeveloped reprocessing and mechanisms that will accelerate recovery and reuse.
16. Encourage adoption of EuCertplast for Australian plastics recycling given it is becoming the global standard
17. Require that sorters and exporters provide Chain of Responsibility certificates on the destination of materials to ensure Australian material is appropriately reprocessed and is not contributing to modern slavery in overseas countries or pollution of land or water
18. That plastics industry associations and manufacturers advise state and federal governments of the difficulties experienced by members in obtaining quality recycled material and encourage governments to form working groups to collaborate on solutions.

Kerbside collections, transfer stations and landfills

19. State governments work with willing local councils, communities and collectors in undertaking trials of different systems for separating glass and other valuable recyclables to determine the best new systems, and integrate continuous improvement built into contracts for innovation on separation and greater quality
20. State governments introduce differential pricing via landfill levies, gate fees and/or rebates that reward landfill, transfer station and resource recovery facility operators with higher environmental and performance standards, such as greater quantities diverted from landfills, higher quality and more separation particularly that meet standards for manufacturers, lower GHG emissions etc

21. Review standards for design and operation of landfills and transfer stations to ensure they support improved separation of an increasing number of recyclables, products and packaging, and also supervision of the public for good separation

Training and professional standards

22. Professional associations and governments encourage secondments/placements in Australia and overseas, and recruit people with backgrounds in manufacture, material reprocessing and joint ventures to enable greater circularity and leveraged investment

Regional cooperation and strategy

Plastics are a globally traded commodity and Australia is a tiny generator and market. Nevertheless, Australia has capacity to make a reasonable contribution due to the high quality plastics in production and use in Australia. It is also one of the few countries with the complete supply chain from oil and gas to production of resin and end markets of plastics and chemicals.

23. Introduce forums for Asia/Pacific regional collaboration on plastics supply and recovery, reprocessing, policies and strategies on circular economy, procurement, labelling and certification. This may include adopting certification standards from EU, such as EUcertplus and EU EcoLabel, and a range of other measure appropriate for the Asia/Pacific region.

2 INTRODUCTION

2.1 THE NEED, AND DISCOVERING THE SOLUTION

The timing of this Churchill tour has been astonishing. We are witnessing the turning point in plastics and materials in the 21st century. The Chinese National Sword bans, the European laws, the community campaigns; this is all contributing to a global change, including in Australia.

Since 2010 I have been concerned at the trends in recycling plastics in Australia. At the time I was the commissioning project manager for the annual National Plastics Recycling Survey at the Plastics and Chemicals Industries Association.[1] Each year I saw increasingly diverging figures in local reprocessing and export, that showed we were not building our local reprocessing capacity, rather choosing the easy path of exporting unsorted material as 'waste'. I also heard many local manufacturers express their frustration at their increasing inability to access quality recycle material from within Australia.

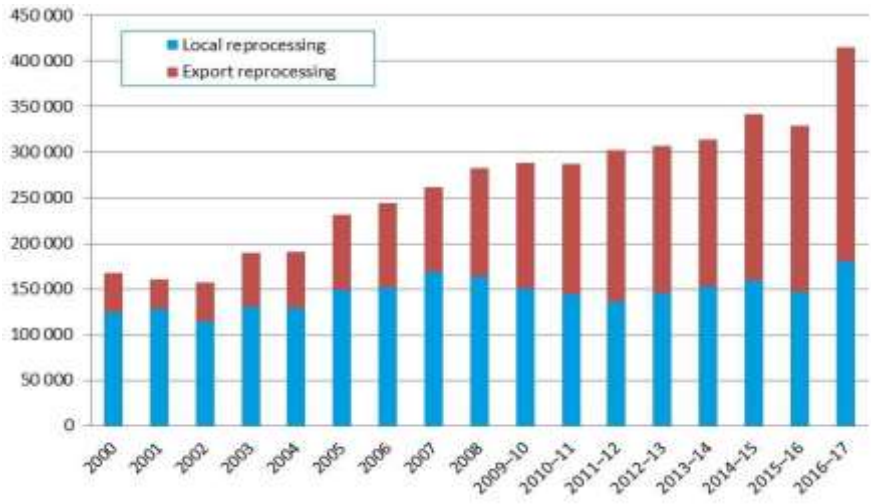

Figure 3 Annual Australian plastics recycling 2000 – 2016-17 (Source: 2016-17 Australian Plastics Recycling Survey)

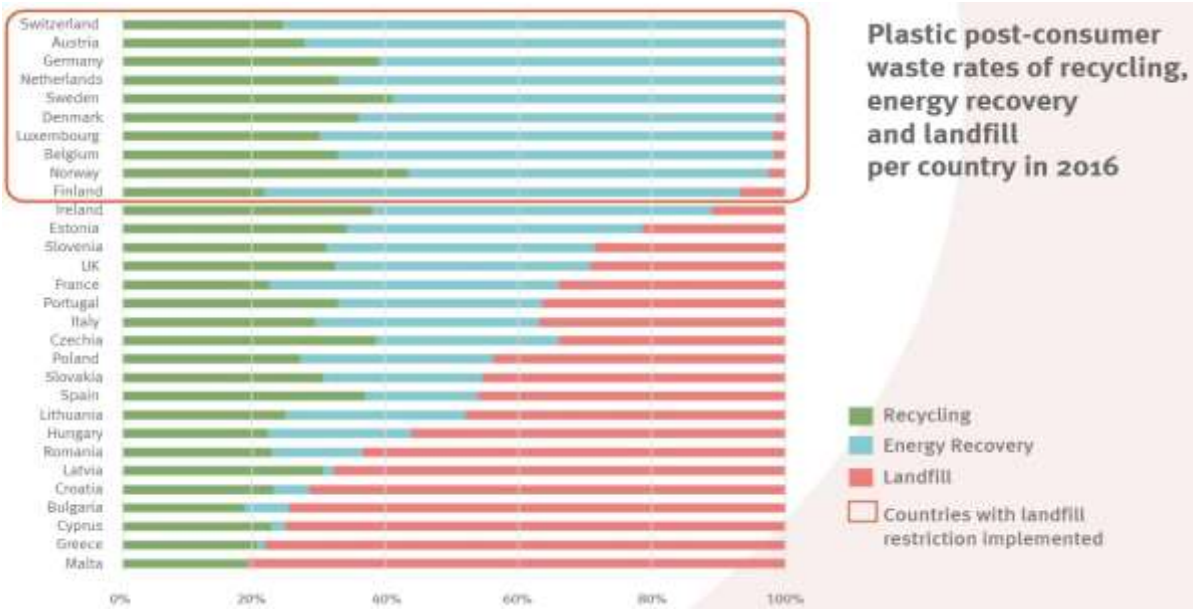

Figure 4 EU-28 nations recycling rates for all plastics incl durables 2016 (Source: Plastics Europe Annual Survey) [2]

[1] 2016-17 Australian Plastics Recycling Survey, SRU and Envisage Works, 2018, p 3.
[2] https://www.plasticseurope.org/en/resources/publications/274-plastics-facts-2017

I was concerned that our plastics recycling rate of ~ 12% was low by international standards (with Malta having nearly 20%) and relatively static, and almost exclusively of packaging. By 2016 I decided it was time to investigate solutions being employed overseas, and by then China - and Europe - were preparing to burst the global recycling bubble.

I also had a challenge. In 2016 in Australia, 'circular economy' was regarded a faraway ideal and we were comfortable and in no rush to change our strategies or very linear systems of 'take, use, dispose'.

Consequently, I was thrilled when I discovered the European Commission's Circular Economy Strategy (released in early 2016). As the first such government strategy in the world, I hoped I might win a Churchill Scholarship to meet and learn from those experts as they grappled with their second priority strategy - on plastics.

2.1.1 High risk, pollution and China

And then in early 2017 China announced it was going to close its borders to 24 'waste' recyclables, including plastics. This was global in its scale and impact. More than 50% of global traded plastic 'waste' (7.35 million tonnes of 14.1 million tonnes) was imported directly into China in 2016 and of this 89% was packaging.[3] To put that into perspective, in that year Australia consumed a total of 3 million tonnes and recycled only 329,000 tonnes (12-14%), 50% which went to SE Asia.

Suddenly it became very clear that we were exposed in Australia and globally in both our production of plastics and reliance upon export of unprocessed recyclables and waste to countries with low cost labour and low environmental standards. And, since China's ban, neighbouring countries have started to follow suit with bans and restrictions to limit the import of unsorted 'recyclables'.

Two ground breaking reports in 2016-17 amplified the problem. The first predicted that by 2050 there would be more plastics in the oceans than fish, and the second reported that 90% marine plastics pollution comes from ten river basins in Asia and Africa where they struggle to process their own, as well as deal with our exported waste recyclable materials.[4] [5]

2.1.2 Plastic packaging and products

While much of Australia's public, media and government attention has been on keeping our kerbside packaging collections going, the fact is China's ban also excludes import of durable products. Consequently, many of these products and their recycling supply chains are experiencing upheaval on reprocessing and destinations.

Packaging is 40% of plastics consumed each year in Australia; 60% is durable products, like garden furniture, hose, pipe and flooring. Unfortunately, currently there are no strategies, collections, separate drop off or programs dealing with durable plastic products in Australia.

While we have a long way to go to catch up to leaders in the field, such as Netherlands and Germany, they show us the foundations and pathway forward.

2.1.3 This focus of this report

The focus of this report is:

- Circular economy measures, especially as they relate to plastics

[3] http://advances.sciencemag.org/content/4/6/eaat0131.full
http://advances.sciencemag.org/content/3/7/e1700782/tab-article-info
[4] http://www.abc.net.au/news/2016-01-21/more-plastic-than-fish-in-the-oceans-by-2050-report-warns/7105936
[5] https://pubs.acs.org/doi/10.1021/acs.est.7b02368

- Plastics recycling and reprocessing.

It is mainly a summary of meetings and site visits, and occasionally I provide some comparisons between sites and countries. The purpose is to describe the building blocks that contribute to success with plastics recycling and a more circular economy. I make a number of recommendations for us to build some of these foundational blocks in Australia.

This report assumes a level of knowledge around plastics, waste and recycling. I have also not included all the observations or notes from interviews. People interested in these can contact me separately.

2.1.4 Sharing the results

It is part of the Churchill Memorial Trust Scholarship to share the results gained from the tour and report on actions. I did not anticipate such interest in this topic when I submitted the application, and I am pleased to have contributed to mainstream newspapers, radio interviews, industry journals and several conferences, workshops and seminars, as well as through my jobs, projects and board roles. Further details are available on my website www.helenmillicer.com.

2.2 My Churchill Project Summary (prepared in November 2017)

I prepared and sent this short statement to people when I was seeking appointments. It summarises our situation in Australia and what I was seeking to address.

One of our best opportunities to create a more sustainable and productive future is to shift to a circular economy. However, we have major gaps in our recycling systems, and a largely linear economy relying on virgin materials.

Australia's plastics consumption is large, around 3,000,000 tonnes per year (enough to fill 40% of the MCG each year) and for a decade our plastics recycling rate has been low, ~ 12-14% (329,000 tonnes). This study tour will focus on plastic with a view to applying the learnings for a circular, sustainable economy.

While we use so much plastic, our risks in Australia are:

1. We rely upon export of plastic 'waste' to Asia for over 50% of our recycling. The quantity of plastics reprocessed for manufacturing in Australia has fallen in real terms over the last decade as governments and companies have focused on easy export to Asia
2. In mid-2017 China announced it will restrict imports of poor quality unsorted plastics, potentially closing the door to many Australian sorting facilities, and sending even more plastic to landfill
3. Our recycling focus is largely packaging. We have no strategies and programs addressing durable plastics in Australia; virtually all our durable plastics end up in landfill or the environment
4. Our strategies, contracts, pricing, systems and programs have prioritised efficiency and volume for collections for export over quality and value for end products
5. Waste companies are increasing pressure on governments to build plants that burn plastics in waste to energy facilities, for poor environmental outcomes compared to reprocessing and renewables
6. Too few private collectors and governments know of and engage with local manufacturers in Australia who could use recycled plastics in product
7. Our manufacturers, jobs and industries are at a disadvantage over international competitors as they are struggling to obtain reliable plastic recyclate, and have a higher environmental footprint.

What we need to do and what I intend to investigate to bring back to Australia for the 21st century:

8. Strategies, targets and programs that are designed for a robust, productive and sustainable circular economy, one that is focussed on end markets and value, not only volume collections, that lifts our recycling rates, puts materials back into product in Australia and reduces our environmental impact.

This project will involve engagement with world leaders who have plans for the 21st century delivering recycling and reprocessing/manufacturing results for a sustainable and circular economy.

2.3 TOUR ITINERARY

The tour started on 21 April 2018 and spanned nearly six weeks. I met people in 39 organisations, and visited several sites and events. Plus there were many impressive leaders and companies I met at the Expos/Conferences. Those with separate summaries outside of this report are marked with *.

Government – policy, strategy and economic instruments	5	• Netherlands Government Circular Economy Unit • European Commission Circular Economy Unit • British Parliament, Business, Energy and Industrial Strategy * • Energy Savings Trust, UK * • Malaysian Investment Development Bureau
Government – program delivery	3	• Netherlands Govt, Circular Economy Procurement Program • European Commission Eco-Label program • WRAP Britain
Consultants for government/industry on policy, strategy, infrastructure and delivery	5	• Elum Consulting, The Netherlands • Cradle to Cradle, EPEA, Hamburg • Resource Association, UK • Sustainable Global Resources, UK • Axion Consulting, UK
Chambers of Commerce	1	• Hamburg Chamber, Industry, Energy and Environment Unit
Peak Bodies / Industry Associations	7	• Plastics Recyclers Europe • European Plastics Converters • Plastics Europe, Marine Litter • European Manufacturers Expanded Polystyrene • International Packaging Assoc (Canning)* • Extended Producer Responsibility Alliance • Confederation European Waste to Energy Plants (Incineration)
Environment Groups	1	• World Wildlife Fund for Nature, Europe
Product Stewardship Schemes	3	• Nedvang (Netherlands) • Vinyl Plus (EU) • FostPlus (Belgium)
Collectors/sorters of plastics and material	5	• Buhck Waste Services (Hamburg) • Nymphenburg Public Drop Off facility (Munich) • Manchester Public Drop Off facility (Britain) • Golden Dragon Industrial Park (Thailand) • All Product Recycling (Thailand)
Reprocessors/manufacturers	4	• Van Werven Plastics (Netherlands) • Axion Plastics (Britain) • Hahn Plastics (Britain) • Heng Hiap Industries (Malaysia)
Incinerators	1	• AEB Amsterdam
Events	3	• European Plastics Recycling Expo/Conference, Netherlands • IFAT Expo/Conferences, Munich • Circular Economy Club, Manchester

3 Building blocks for a more Circular Economy for Plastics

There are a few fundamental building blocks for a more circular economy. They are identified here and a great deal more can be read elsewhere.

The Waste Hierarchy is used globally. First developed by Dutch parliamentarian Ad Lansink (Lansink's Ladder) and integrated into the Netherland's waste management plan in 1979, it was then integrated into law in 1994 and then the EU Waste Framework Directive.

It sets out steps of avoidance of waste, recovery of materials, generation of energy from residual and landfilling what is left over.

Figure 5 The Waste Hierarchy

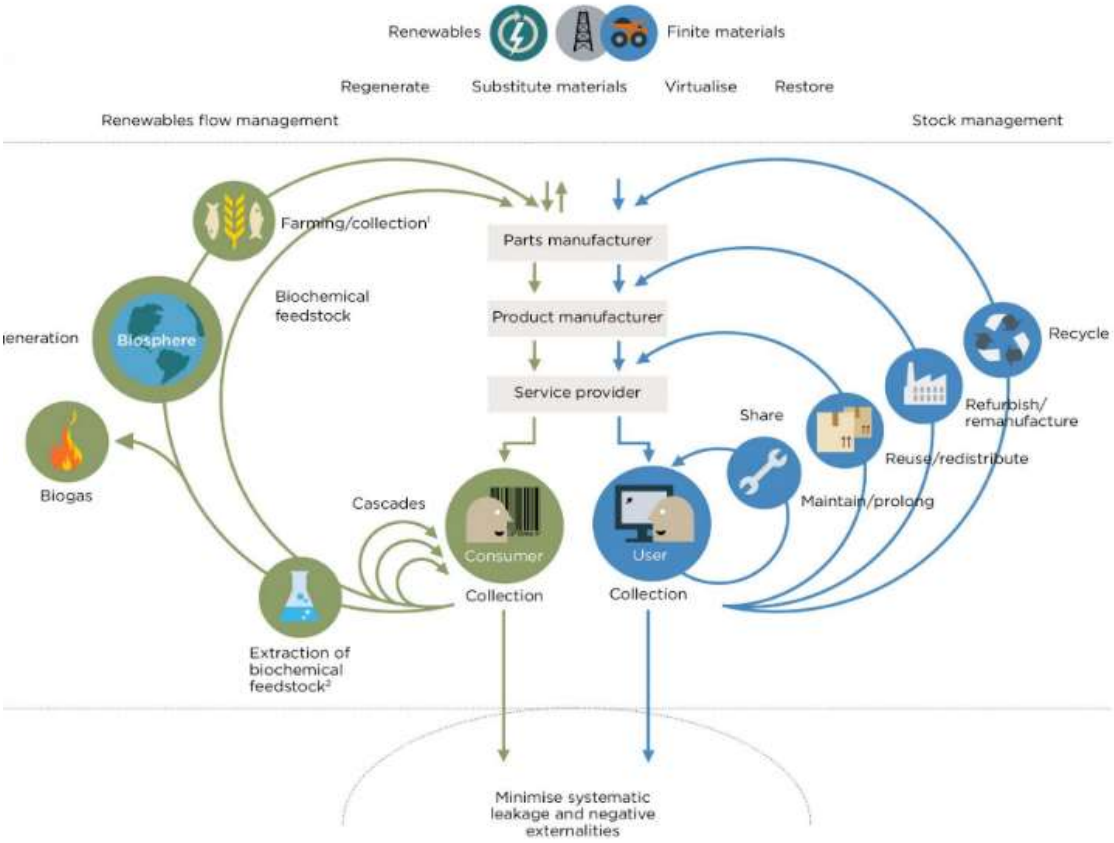

Figure 6 The Circular Economy

The Circular Economy diagram is an adaptation of the Waste Hierarchy by the Ellen MacArthur Foundation[6]. It also moves away from incineration of non-renewable materials. It beautifully presents two distinct circular systems of materials that should be fed back into themselves:

1. Renewable bio material and
2. Finite materials such as cement, aluminum, oil-based plastics.

[6] https://www.ellenmacarthurfoundation.org/circular-economy/overview/concept

This has been adapted further to itemise the interventions that are required to shift to a circular economy and cut emissions. In June 2018, the consulting firm Material Economics published a ground breaking report *The Circular Economy, a powerful force for climate mitigation*[7] that provides recommendations on actions for key material streams to improve circularity and reduce emissions.

With regard to plastics, they have produced a very useful diagram on the necessary building blocks to improve the circularity of plastics (Figure 7), and also rated current measures in the EU (Figure 8). This report confirms the market failures around plastics selection, use, management and recovery and how they need to be addressed.

It is also useful for our progress in Australia.

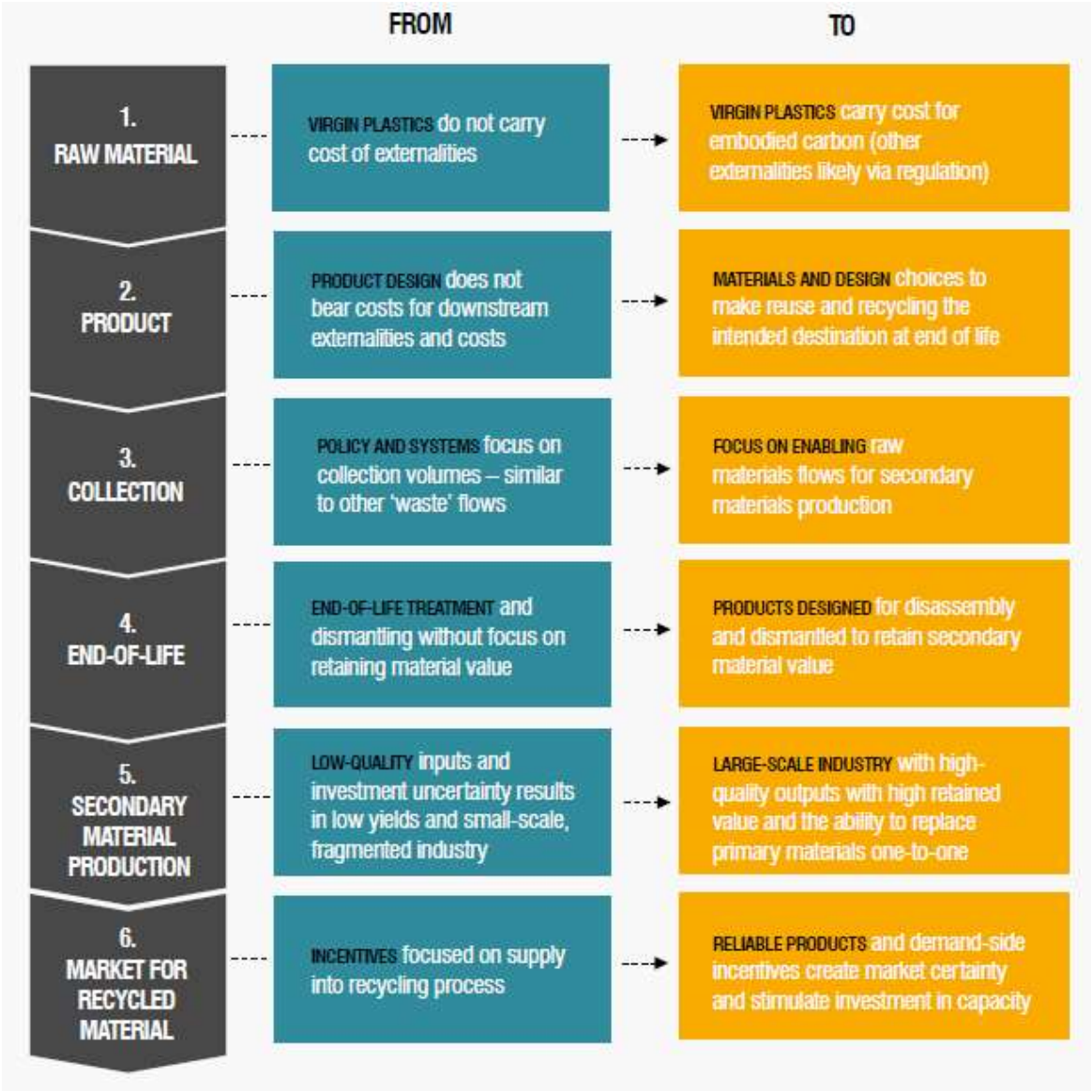

Figure 7 Fundamental steps and actions across the plastics value chain that require transformation to improve recycling (Source: Material Economics, 2018, pg 85)

[7] http://materialeconomics.com/publications/the-circular-economy

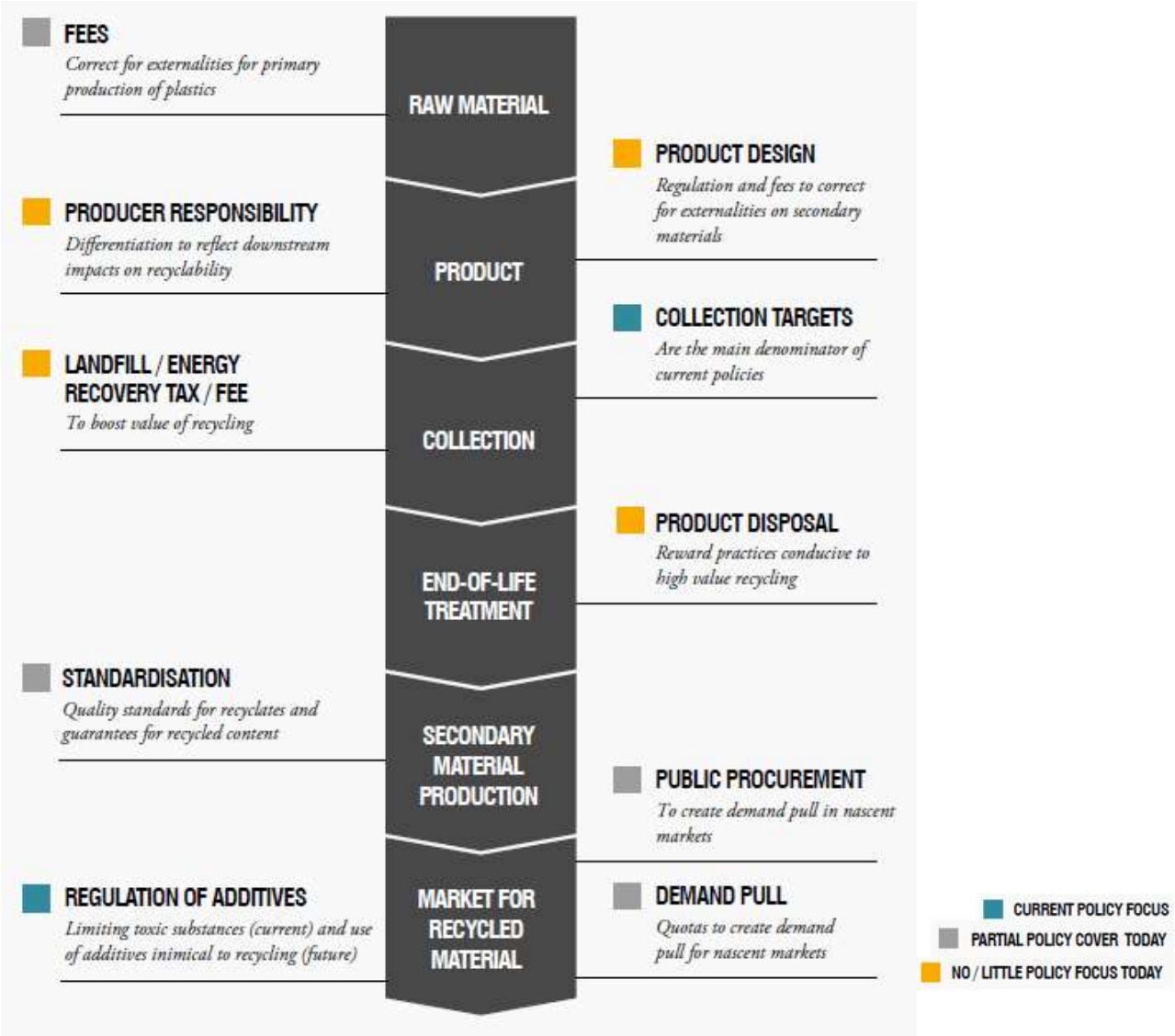

Figure 8 Analysis of current policies that only cover parts of the barriers to high value plastics recycling (Source: Material Economics, 2018, p 95)

It was very useful to read this report after concluding the Churchill tour in May, to see how much had been covered in my discussions with people, and also that the EU, Netherlands and Germany have been moving on these actions for some time.

Figure 8 shows that there is room for improvement within the EU. An Australian version would show that we are currently only addressing one area, namely landfill fees.

The changes will take time. Some actions will require global agreement as the EU Commission is proposing, such as 1. Raw Material: Correcting fees for externalities for primary production of plastic.

Positively there is great potential for us in Australia to move forward, albeit from a very low base. My recommendations in this Report go some way to proposing key steps forward.

4 EUROPEAN STRATEGIES AND PLASTICS

In this section I present the strategies of the EU-wide organisations such as the EU Commission, key industry bodies and environmental groups. Country specific observations are in the next section. Meetings and observations for this section were undertaken at various places such as IFAT in Munich, not only in Brussels.

Overview

Europe operates as a trading and negotiation group pursuing collective harmonization and competitive advantage whilst maintaining cultural individuality. The EU Commission HQ is located in Brussels, capital of Belgium, and therefore there are many European influencers located there, such as industry associations and environmental groups.

The EU Commission is a fourth level of government with a role in strategy, harmonization, targets and financial markets across a range of areas. Each nation has autonomy on their own laws, implementation and areas specific to their country such as education and cultural matters.

Countries such as Netherlands and Germany are leaders in recycling given their years of continuous improvement implementing measures on circular economy, landfill, recycling rates and financial mechanisms, whereas others like Greece are behind. Such differences reflect the vision, collaboration, history, politics, governmental and organisational systems and geography of the respective countries.

The closest regional cooperative structure for Australia with neighbouring countries in Asia/Pacific is probably ASEAN. It would be beneficial to have a platform for cooperation on circular economy, material efficiency and productivity, the related strategies, structures, data or analysis. This would strengthen our region, competitive advantage and provide a more holistic approach to strategy, laws and programs.

4.1 EU COMMISSION, DIRECTORATE GENERAL ENVIRONMENT

Head of Unit, Sustainable Production, Products & Consumption, Circular Economy, Hugo-Maria Schally
Senior Policy Manager, Werner Bosmans, (author of CE Plastics Strategy)

The Circular Economy Plastics Strategy (CE Plastics Strategy) was released in January 2018 and then adopted by the EU Parliament in May 2018.[8] It had been clearly foreshadowed in the ground-breaking Circular Economy Action Plan (released Dec 2015), and set out to

> *'address the challenges posed by plastics throughout the value chain and taking into account their entire life-cycle'.*

This alerted many people to what was to come. It is significant that plastics was the focus of the second strategy, due to market failures and the challenges around recovery and pollution.

The significance of the CE Plastics Strategy is that it addresses all plastics, not only packaging. Also that the pledge target of 10 million tonnes by 2025 for all plastics in EU is for *reprocessing* not *collection* and is a giant jump from current levels of ~3 million tonnes in 2018. This has generated a major review of recyclability, reprocessing data and of reprocessing capacity of all plastics in Europe by brand owners, manufacturers, associations and governments.

The Vision statement in the Strategy document is fascinating and illustrates why it has been met with support from many quarters:

[8] http://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy.pdf

"A smart, innovative and sustainable plastics industry, where design and production fully respects the needs of reuse, repair, and recycling, brings growth and jobs to Europe and helps cut EU's greenhouse gas emissions and dependence on imported fossil fuels."

The joint emphasis upon material productivity and GHG emissions will continue to grow for all materials, including plastics, and the ground-breaking fine report from Material Economics will be a turning point. Their June 2018 Report *The Circular Economy, a powerful force for climate mitigation* provides powerful analysis on the effect of different measures.[9] Figure 9 shows that high quality mechanical recycling of plastics has the lowest carbon emissions of all options.

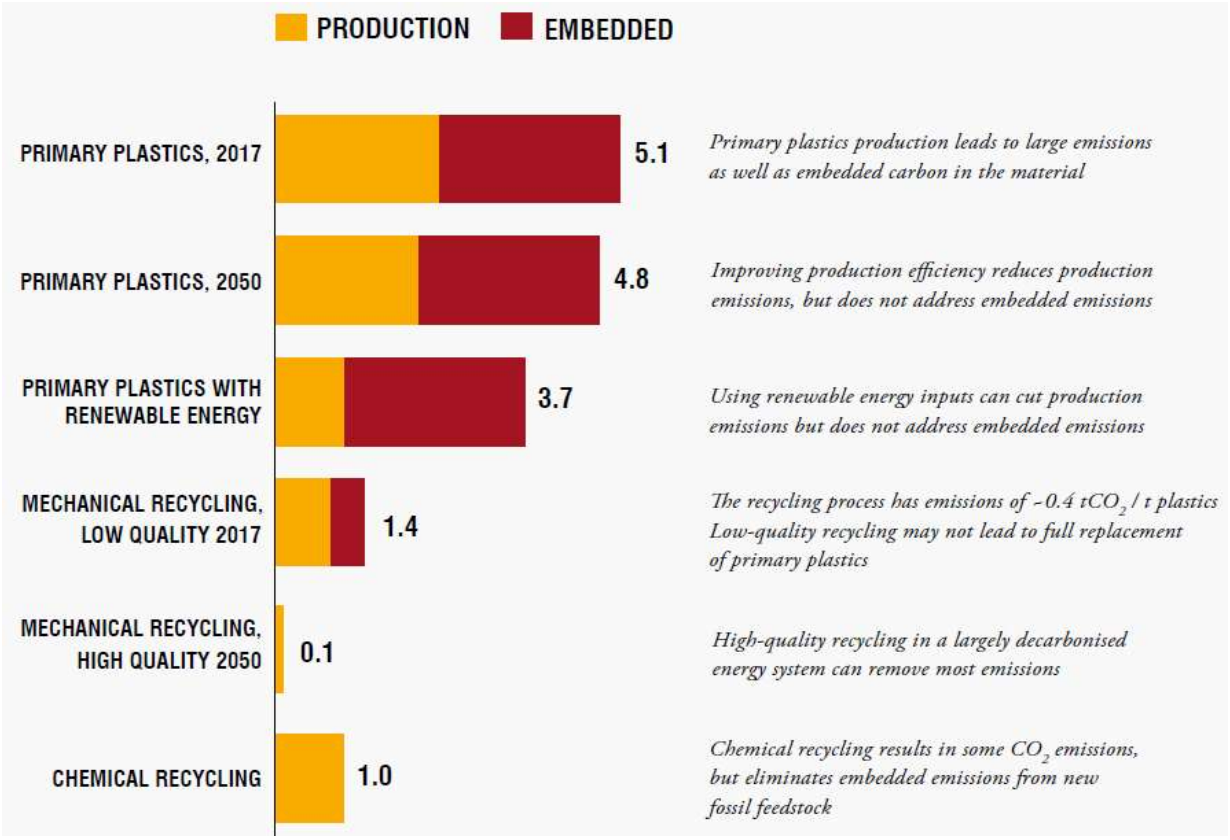

Figure 9 Plastics recycling has significantly lower CO2 emissions than other options for plastics production (Fig 3.4, p81)

In summary, actions in the EU Commission's CE Plastics Strategy include (and accord with key recommendations of Material Economics in their report):

1. Improving the economics and quality of plastics recycling
    a. Design for recyclability
    b. Boosting demand for recycled plastics
    c. Better and more harmonised separate collections and sorting.
2. Curbing plastic waste and littering
    a. Preventing plastics in our environment
    b. Establishing a clear regulatory framework for plastics with biodegradable properties
    c. Addressing micro-plastics.
3. Driving innovation and investment toward circular solutions
4. Harnessing global action.

[9] https://www.sitra.fi/en/publications/circular-economy-powerful-force-climate-mitigation/

In my meeting with both Hugo Schally and Werner Bosmans we discussed current and future measures the Commission was pursuing, including:

- an EU-wide campaign where producers, recyclers and industry have to pledge to meet a 10 million tonne target of reprocessed plastics in the EU by 2025 (market pull)
- investment into plastics, infrastructure and processes (quality and cost-effective recovery)
- bans on select single use and oxo-degradable plastics (over-production, waste and litter)
- and removal of hazardous substances (removing barriers to recycling).

It was impressive to hear all the policy, strategy and legislative projects underway, including revision of minimum requirements for EPR schemes and of the Waste Directive, the negotiations and timetabling.[10] I heard the story about how the EU Commission changed track from 'end of pipe' waste policy thinking pre 2011, to creating a winning synergy between sustainability and economic policy with the Circular Economy Roadmap in 2016.

It was clear the Commission had come a long way in understanding the complexity of diverse plastics, and how this differed to other material streams such as metals and construction products, and the barriers to increased plastics reuse and retained value. They realised a more sophisticated, multifaceted approach was required for plastics, with manufacturers at the core given they were the best end destination and the determinants of recyclability. They recognised leakage occurred at all points in the production and consumption process, resulting in environmental and economic costs through composition, design, production, use, collection and reprocessing. They see plastics as too cheap and insufficiently valued, and that public institutions and the environment are bearing the cost for overuse and undervalue.

It was also fascinating to hear how they developed the CE Plastics Strategy through 2017, the research and modelling they undertook, and their secrets of success.

4.1.1 Single use plastics and marine litter

At the time of my visit the EU Commission CE team were deliberating the detail on actions to be taken to address single-use plastics and their impact on marine environments.

Three weeks after our meeting, on 28 May the European Commission announced proposed new rules for 10 priority single use plastics to reduce marine litter, as well as lost and abandoned fishing gear.[11] Independent research commissioned by EU Commission indicates that these 10 items constitute 43% of all marine litter[12], and with fishing gear equals 70% of all marine litter.[13]

The diversity of actions/approaches shows the different levers the EU Commission chooses to use.

Action	Items
Ban	Plastic cotton buds, cutlery, plates, straws, drink stirrers, balloon sticks. Single-use plastic drink containers can be sold only if their caps and lids remain attached.
Consumption reduction targets	Member states have to reduce use of plastic food containers and drinks cups, through targets, price on items and/or offering alternatives

[10] http://www.consilium.europa.eu/en/press/press-releases/2018/02/23/eu-ambassadors-approve-new-rules-on-waste-management-and-recycling/
[11] http://europa.eu/rapid/press-release_IP-18-3927_en.htm
[12] https://ec.europa.eu/info/news/single-use-plastics-are-you-readytochange-2018-jun-05_en
[13] http://mcc.jrc.ec.europa.eu/documents/Marine_Litter/MarineLitterTOPitems_final_24.1.2017.pdf

Obligations for producers	Help cover costs of waste management and clean up and awareness for: food containers, packets, wrappers, drink containers and cups, tobacco filters, wet wipes, balloons and lightweight plastic bags. Incentives will be given to industry to develop less polluting alternatives
Collection targets	All member states obliged to collect 90% of single-use plastic drink bottles by 2025, eg through deposit refund schemes
Labelling requirements	Sanitary towels, wet wipes and balloons require standard labelling on disposal, environmental impact and use of plastics in the product
Awareness raising	Member states obliged to raise consumer awareness of impact of littering, reuse systems and waste management for all products.

Table 1 Summary of levers proposed by the EU Commission on priority plastics

The Commission statement says it is of the view that 'while plastics are a convenient, adaptable, useful and economically valuable material, they need to be better used, reused and recycled.'

This announcement on 28 May was based upon consultation with industry and public in Europe from Dec 2017-Feb 2018 which led to the design and scope of these various rules. It was also accompanied by a *Proposal for a Directive to Member States* and an *Impact Assessment*.

These proposals were to then go to the European Parliament and Council for adoption as a priority for tangible results to be delivered before the EU Parliament elections in May 2019. This is a quick action with results required within 12 months.

In addition, on 5 June, World Environment Day, the Commission launched an EU-wide awareness campaign on these items and issues[14], and stated that it intended to drive change at the global level through G7 and G20 through the Global Sustainable Development Goals.

4.1.2 EU Ecolabel for high environmental performance and procurement programs

Policy Officer Sustainable Production, Products & Consumption, EU Commission, Kristine Dorosko

There are different ecolabels for different product categories/industries in the world, and the most widely used is the EU Ecolabel.[15] This has over 69,000 approved products and services providers available to the market through nearly 2,000 licences to approved companies/organisations.

The EU Ecolabel is a third-party certified voluntary label set up and managed by the EU Commission, Directorate of Environment with the support of national competent approved bodies in the 28 EU member states. Established 25 years ago it now has 27 products and service categories ranging from cleaning products to computers, footwear and tourist accommodation services. It formed part of past EU Action Plans, on Sustainable Consumption and Production and on Industrial Policy in 2008, and now forms a plank in the program for the Circular Economy Strategy.

Companies/organisations can apply for certification for their product/services checking for pass/fail against multiple criteria that have been developed from a life-cycle perspective. Applications are reviewed by an independent third party. To keep up with changes in product design and service standards, the criteria are reviewed by expert panels generally every 4-5 years, and where necessary the changes are formalized in EU law.

[14] https://ec.europa.eu/info/news/single-use-plastics-are-you-readytochange-2018-jun-05_en
[15] http://ec.europa.eu/environment/ecolabel/index_en.htm

Kristine reported a dramatic increase of 20,000 applications in 12 months after the release of the EU Circular Economy Strategy in 2016 which prompted even more governments and corporates to reference the Ecolabel as a requirement in their purchasing and tender specifications. She noted that despite the fees paid by companies to have their applications processed a significant proportion are SME in size, as they are keen to establish some market advantage and credibility over bigger competitors. This seems contrary to what one might expect, but shows that SMEs see the value in this investment to their business and the power of market procurement to raise standards.

In addition to meeting tender specifications, approved products/services are able to display the Ecolabel in their communications and on their products on retail shelves, contributing to growing customer awareness. Fees paid by companies vary between different countries, from €1,000 p/a in one country and €300 in Latvia, and there is also variation to accommodate different size/turnover of companies. These fees contribute to covering the costs of the audits and administration, and are shared between member states and EU Commission.

With respect to plastics and a more circular economy, this summary shows how the Ecolabel is assisting drive change (these are two examples). It is important to note that the ban on microplastics in cosmetic products was evident in the Ecolabel program well before it became EU law. The Ecolabel effectively builds a base of support and enables changes to be 'tested' before they become law.

Ecolabel product/service	Ecolabel Criteria	Notable points re plastics/ recycling
Rinse off cosmetic products (soaps, shampoos and hair conditioners) [16]	• Toxicity to aquatic organisms: Critical Dilution Volume (CDV) • Biodegradability • Excluded or limited substances and mixtures • Packaging • Sustainable sourcing of palm oil, palm kernel oil and their derivatives • Fitness for use • Information appearing on the EU Ecolabel	• Ban of microplastics in contents • Primary packaging only • Only compatible sleeve/label or closure with the packaging
Cleaning Services (indoor service for all sorts of buildings, also glass surfaces, excluding industrial/ production sites) [17]	The mandatory criteria are: • Use of cleaning products with low environmental impact • Cleaning product dosing • Use of microfibre products • Staff training • Basics of an environmental management system • Solid waste sorting at the applicant's premises • Information appearing on the EU Ecolabel There are also 12 further optional criteria such as efficiency of washing machines.	• Non-disposable textiles are used ie micro fibre cloths • Staff training in solid waste management at both the client site and company's premises

Table 2 Summary of EcoLabel criteria for two sample products, 2018

[16] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014D0893

[17] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.114.01.0022.01.ENG&toc=OJ:L:2018:114:TOC

Kristine noted that procurement policies have resulted in cleaners and cleaning detergents manufacturers being the greatest adopters of the Ecolabel. Kristine anticipates the next industry sector/product category to accelerate use of the Ecolabel will be lubricants, with others to follow.

4.2 Professional and Advocacy Organisations in EU

Crucial to a shift to a more circular and sustainable future are the expert organisations in industry and environment that contribute to policy, strategy, public discourse and programs. At no time did I hear or see anyone disagree with the necessity to tackle climate change, material efficiency, circular economy or plastic in litter; they appear to be more united and proactive than our Australian equivalents.

There are some parallels and differences in Australia. First difference is their size, capacity, professionalism and sophisticated programs.

In terms of the plastics groups, not only are they larger with bigger budgets and more members, they are also more integrated as organisations, sharing resources (office space and back-office functions), directors on boards, collaborating on projects, advocacy, research and communications. This approach results in effective, integrated, well-resourced and powerful associations and programs, and therefore a stronger industry in Europe. One leading result of this sort of collaboration is the formation of Vinyl 2010, now entitled VinylPlus and Recovinyl (see next entry).

The environment groups are also well networked in both EU and Australia. However, in terms of the plastics and chemicals industries there is no Australian equivalent collaboration on policy, strategy and programs as in Europe. Chemistry Australia (previously known as Plastics and Chemicals Industries Association (PACIA)) is no longer an umbrella group or coordinating organisation for all plastics or chemicals groups (vinyl, styrenics, recyclers etc). There are a number of small specialist plastic industry associations and the Society of Plastic Engineers with an active engagement and seminar program.

4.2.1 EU Plastics Converters (EuPC)

Managing Director, Alexandre Dangis

EuPC is an umbrella association for both national and polymer/application associations. Alexandre Dangis is a key strategist and influencer in Europe and until 2017 was also the MD of Plastics Recycler's Europe as well as EuPC.

In our meeting Dangis made some astonishing revelations, namely that the EU Plastics Recyclers participated in a deputation to China in 2016, seeking agreement from the Chinese to require certification of imported plastics using the EU's standards. EU plastics recyclers were finding the 'leakage' of unsorted and unprocessed plastics to China was undermining their investments in strategies, capital, collection systems and programs such as EuCert Plast.[18] Clearly this was mutually agreeable, as China announced its bans in early 2017.

My discussion with Dangis was a turning point for my Churchill tour, as I suddenly realised the immensity of vision and determination of the European industry and government in designing a framework for a more circular, productive and sustainable economy. I realised that they were pursuing all the essential elements in a strategy which includes bans, certainty of end markets and standards, supply chain solutions for inputs, collections and destinations.

Dangis has good reason to speak with authority, as the CEO of EuPC he represents 50 associations across EU member states and polymer product manufacturers of plastic products as diverse as pipe, furniture and car parts. Mainly small to medium sized companies, EuPC estimates there are 50,000

[18] https://www.eucertplast.eu/

converting companies in EU, producing 50 million tonnes of product, employing 1.6 million people with turnover of €260B.

The EuPC is generally very pleased with the EU Commission's CE Plastics Strategy, appreciating its balanced approach to a complex task, except for two elements of concern, namely that:

1. some plastic converters will close unless they are able to transition to more favourable polymers or durable products
2. the strategy said very little about education and public responsibility for litter, laying most of the responsibility with the plastics industry.

The EuPC is pleased that the EU Commission did not pursue additional regulation from the outset, however, is convinced that plastics are so diverse in different applications, that supply chain collaboration is the way forward to increase recycled content. Danglis is of the view that the path forward is along the lines of VinylPlus, namely, a controlled and methodical approach utilising the expertise and networks in specific polymers supply chains in specific sectors.

Given his knowledge of the whole plastics and recycling industry across Europe he thinks the EU Commission's pledge is achievable, but by 2030, not 2025. He noted that there are high recycling rates already with PET around 1.8M tonnes per year, and PVC aiming for 800,000 tonnes by 2020. But he said that the other polymer sectors of polyoelfins (PE) and polystyrene (PS) still needed a strong market for recovered material.

PET has the benefit of existing deposit systems for beverage containers, and the legislation exists for packaging collection and reprocessing and recycled content. The costs, equipment, collections and managing entities exist so Dangis was confident PET will comprise a large slice of the pledge pie. Likewise he thinks PVC is well on track.

He was convinced that many countries are going to be very surprised when they realise that the EU Commission target is for 10 M tonnes *reprocessed* plastic, not for *collected* plastic, which is the common interpretation and measurement. He was of the view that this will hasten moves for better reporting, and understanding of different polymers and required standards for collections and sorting for recovered material to be a substitute for virgin in quality end products.

We ended our conversation with a number of observations. He is unimpressed by brand owners and organisations specifying for recycling or pledging recyclability when what is required are targets for recycled content. He thought it was illogical to ask the consumer to sort and then send the resource somewhere else, such as China, and that such a practice undermined a more circular economy. He was critical of Extended Producer Responsibility (EPR) Schemes for not including converters amongst their members/stakeholders, and that incinerators are a significant lobby alongside EPR that inhibit circularity.

4.2.2 European Plastics Recyclers (PRE) (Plastics Manufacturer)

President and Director, Group Recycling, CeDo, Ton Emans

PRE is an active association with a strong President. The Association has grown from 7 in 1996 to over 120 company members. President Ton Emans is possibly the most influential man in plastics recycling in Europe working closely with Alexandre Dangis, previous CEO of PRE, now CEO of EuPC.

Emans is incisive and persuasive in arguing the case for changes by government and industry. His powerful advocacy comes from his vision and leadership experience in reprocessing plastic for product manufacture. He has been a key negotiator in the recent CE Plastics Strategy, and behind the formation of the following important initiatives:

- EuCertPlast (the certification scheme) (Ref section 4.2.3)
- the annual and successful EU Plastics Recyclers Show (building the expertise)
- Annual recycling awards program (celebrating leaders)
- Recyclass Platform (design advice on plastic packaging)
- Definition of 'plastics recyclability'.

PRE and Emans are strongly of the view that industry and government must work together to ensure quality plastics are diverted from landfill, if necessary banned from landfill, with clear design requirements, structured separation, collection and reprocessing schemes for ready end-markets supported by procurement policies and labels.

Emans and PRE are gearing up for a new battle around biodegradable plastics and use of the term 'recyclable'. In this they are lining up with environmental groups, such as Friends of the Earth, Surfrider Foundation Europe and Zero Waste Europe. They contend that given biodegradables are not compatible with normal plastics they should not be used in the same applications and there must be a clear and robust position on the use of biodegradables.[19] PRE cites a Position Paper *Bioplastics in a Circular Economy : The need to focus on waste reduction and prevention to avoid false solutions*:

> *"No finished product has yet been approved as marine biodegradable and the generic European standard on composting of packaging (EN 13432), only guarantees the biodegradation of packaging under managed, industrial conditions."* [20]

Emans is clear in his views, and sometimes incurs criticism from plastics companies. For example, he supports the measures proposed by the European Commission, including phase out or setting high standards on plastics whether durable product or single-use items for optimum recycling.

Emans is thrilled at China's ban seeing it as a bonus for greater industry investment and innovation in Europe, and a stronger, more competitive and resilient Europe. His vision is for quality plastics recovered for reuse in EU. At the PRE Conference/Expo in Amsterdam he was positively buoyant. He presented on the scale of the change required in the EU to meet the EU targets with new facilities, jobs and investment.

He says industry must change with significant and rapid increases in recycled content in plastics packaging and products. This must be concurrent with greater standardisation of the composition, design and collection of plastics. He supports strong and clear calls from the EU Commission for action by nation states and industry on targets, trials to include recyclate, standards for sorting, price penalty of non-recyclable packaging.

He predicts that the plastics and chemicals industry will undergo major structural change, growth in jobs and productivity as companies and communities shift to greater recycling and reprocessing in Europe. He predicts greater vertical integration, especially as resin crackers reach end of life in EU, oil and gas supplies tighten and prices increase.

He is concerned that other developing nations are under pressure to accept poor quality unsorted plastics as China did in the past. Hence his determination to see the EU CertPlast grow as the standard.

4.2.3 EuCertPlast

In 2009 a number of EU plastics groups, led by PRE (and including EuPC and VinylPlus), applied and received funding from the EU Commission Eco-innovation program for a 3 year project to harmonise and create an EU-wide certification protocol, and conduct audits at 25 facilities. The project focused

[19] https://www.plasticsrecyclers.eu/biodegradable-plastics

[20] https://zerowasteeurope.eu/downloads/joint-position-paper-bioplastics-in-a-circular-economy-the-need-to-focus-on-waste-reduction-and-prevention-to-avoid-false-solutions/

on the toughest, namely on post-consumer plastics recycling plants. The purpose was to bring about improved financial, technical and supply efficiency and certainty for the plastics and recycling industries.

While the project was completed in 2012, it accelerated when China announced its ban in 2017. The EuCertPlast Certification[21] has now gained recognition from a range of entities, including the German Blue Angel Label, meaning that companies supplying product or packaging made with recycled plastics approved by such labels must now 'verify origin and composition of the plastics recyclates used by means of a certificate (including report) pursuant to the EuCertPlast certification scheme'.

The list of certified recyclers of over 100 companies is searchable by polymer type, country and company name. Auditors are selected and approved, listed and available to review applicants. They come from a combination of consultancy and plastics associations.

In this way, the EU ecolabels are ensuring that there are standards in the handling and composition of plastic recyclate material. This measure has given certainty of high value markets to plastics reprocessors not only in Europe, but around the world.

The Europeans have succeeded in establishing a global standard for quality of recycled plastics reprocessing, and linking it to procurement labels.

4.2.4 Plastics Europe

Plastics Europe is the pan-European association of over 100 member plastics manufacturers across packaging, building and construction, agriculture, healthcare, energy, transport etc. It shares office space within the larger Cefic (European Chemical Industry Council) building. Plastics Europe (PE) also works closely on strategy development, advocacy and research with the related associations for Plastics Converters, Recyclers and for Machinery. PE also has a number of divisions including European Council of Vinyl Manufacturers (EVCM, see below re VinylPlus).

They all intersect, collaborate and negotiate, with cross-board and project representation and sometimes jointly funded projects. They have produced publications and support members with issues such as GHG emission reductions, energy efficiency, material efficiency and minimising marine pollution.

Plastics Europe has two senior management roles and teams focused on two specific polymer supply chains of vinyl (PVC) and styrenics (PS). This is a reflection of various factors: the level of scrutiny, projects under management, ways in which these supply chains work and the number of companies in these polymer supply chains.

There was a frenetic activity at Plastics Europe in May as the association and members were working on ways to meet the EU Commission's Pledge requirement and deadline. Plastics Europe, like related plastics organisations is supportive of the first Circular Economy Strategy and involved in negotiations around the CE Plastics Strategy. Through 2017 they produced a number of papers providing input into the EU Commission's CE Plastics Strategy.[22]

[21] https://www.eucertplast.eu/about

[22] https://www.plasticseurope.org/application/files/4215/1708/0074/20170907_final_views_on_a_strategy_on_plastics_updated_sept.pdf

Level of circularity / Application sector	Resource Efficiency						Impact on marine litter	Life time of products
	Material Efficiency	Energy Efficiency	CO_2 Reduction	Recyclability	Durability	Bio-degradability		
Packed goods	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	High	Short/ Medium
Building & Construction	✓✓	✓✓✓	✓✓✓	✓	✓✓✓		Very low	Very long
Automotive	✓✓	✓✓✓	✓✓✓	✓	✓✓		Low	Long

Figure 10 Examples of circularity levers for plastics application sectors according to life cycle approach (p7)

The above table summarises the case being put by Plastics Europe for a strategy that recognises the different applications, lifespan and impacts of plastics. This assisted the EU Commission settle on a flexible approach, namely for industry to determine how they would meet an overall pledge target.

Plastics Europe has also included a number of recommendations, which included: 'Call for zero plastics waste to landfill as part of municipal solid waste management'. I am sure that this is one of the EU Commission's cards they may use with nation states if the pledges submitted are not sufficient, and for this they will have the support of the plastics industry.

4.2.4.1 Marine pollution

Senior Manager, Environmental Affairs, Plastics Europe, Dr Anne-Gaelle Collot

Anne-Gaelle Collot discussed Plastics Europe's position with regard to plastics pollution. The Plastics Europe team are feeling defensive of their industry given the growing government and environmental group strategies, programs, public and media scrutiny of plastics pollution.

Plastics Europe and others have developed Declarations and voluntary programs for members for areas they can control ie company operations, sites and logistics (transport). These have achieved good outcomes, with most member companies participating and complying. The association notes that most marine plastic litter is the result of public or other industry litter, poor collection systems, etc. They are concerned that the plastics industry is bearing the brunt of the EU Commission's demands when they have no control over public and other industries litter habits, which are the main contributions to environmental and marine pollution.

The industry's sustainability related measures include Responsible Care (1985) and the Declaration of Global Plastics Associations for Solutions on Marine Litter (signed 2011). Operation Clean Sweep (OCS) developed by the US Plastics Industry Association in 1990 is one related program (clean-up sites to minimise plastic resin pellets getting into waterways and the marine environment).

Plastics Europe produces an annual report on results of projects within OCS, the methods pursued, results and uptake by plastics companies.[23] The report states there has been a 75% reduction in pellet losses over the last decade. It also draws on research by scientists which show a dramatic decline in the number of pellets in the Atlantic gyre since the 1980s, and a 2/3 decrease in the stomach of a signature bird species, the Northern fulmar. However, there were still 2 pellets per bird stomach in the 2015 independent scientific study (Plastics Europe, Operation Clean Sweep Report 2017, pg 5).[24]

[23] https://www.plasticseurope.org/en/newsroom/press-releases/plasticseurope-presents-operation-clean-sweepr-report-pellet-containment-european-plastics-industry-reinforces-its-commitment-fi

[24] http://www.opcleansweep.eu/operation-clean-sweep-report-2017/

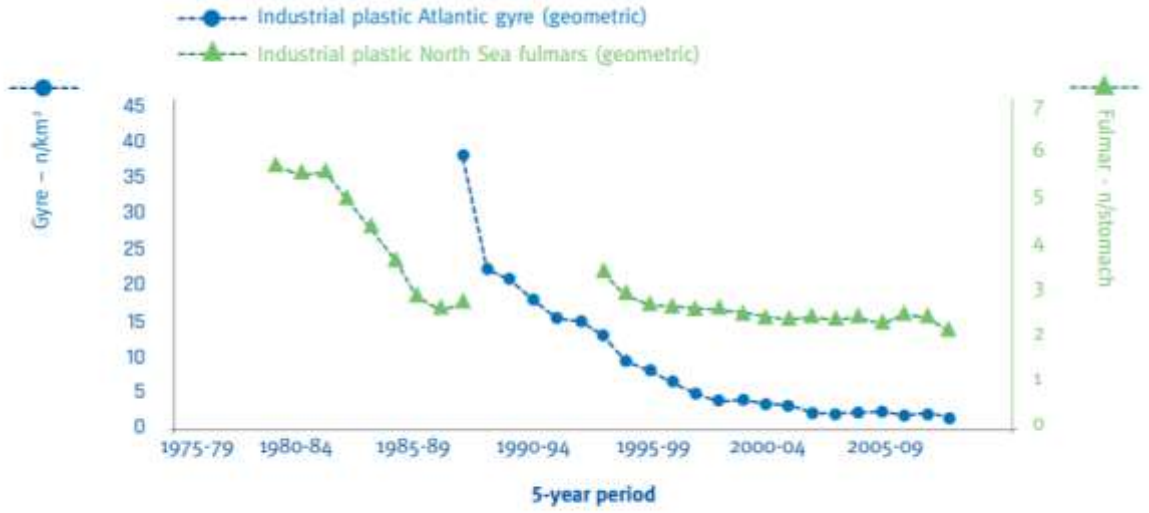

Figure 2: Comparative trends in numerical abundance of industrial plastics in stomachs of North Sea fulmars and surface densities in the North Atlantic subtropical gyre. Source: Franeker & Law, 2015[7]

Figure 11 Comparative trends of pellets in birds in North Atlantic gyre

Through OCS, Plastics Europe has obtained company commitments from 50% of relevant companies, representing 96% of pellet sales in EU; all large manufacturers are signatories, with unsigned companies being small operators. This is a high rate for a voluntary program, and there will be variations in standards of compliance amongst signatories. As part of the commitment signatories are required to liaise with their supply chain, including converters (who make product using the pellets) and logistic companies. Plastics Europe is finding that the biggest challenge now is port facilities where spills may occur.

Plastics Europe is currently developing a formal reporting scheme as the EU Commission is pushing for audits of sites to check performance. This may result in 100% companies signing up to the program and higher compliance amongst signatories.

4.2.5 VinylPlus

Senior Manager Technical, Arjen Sevenster

VinylPlus is the specially formed entity responsible for sustainability initiatives for the vinyl (PVC) supply chain. The VinylPlus program has achieved a great deal since formation in 2000, and significantly, is a model for the EU Commission on what can be achieved by other polymer supply chains as they progress forward with the Plastics Circular Economy Strategy and Pledges.

VinylPlus was formed by four associations, all who remain on the board:

1. European Council of Vinyl Manufacturers (ECVM)
2. European Stabiliser Producers Association (ESPA)
3. European Plasticisers
4. European Plastics Converters (EuPC).

Over time, the industry has introduced progressively strict voluntary environmental requirements upon the manufacture of vinyl, starting with specifications on handling and emissions of vinyl chlorlide monomer to elimination of other additives such as cadmium. These shifts were the industry's response to fatal workplace incidents and public environmental campaigns. In responding this way, the vinyl industry has shown what can be achieved in reduced environmental impact through expertly designed voluntary industry agreements.

Not surprisingly, with so many years of active management and data gathering on the supply chain, this industry is better positioned than other industry supply chains, even PET and PE, to have input into the EU Commission's CE Plastics Strategy.

In terms of recycling, their polymer-specific journey began in earnest in 2003 with the formation of the not-for-profit stewardship entity Recovinyl. Their first data report in 2004 on post-consumer PVC from non-regulated waste streams showed EU recycling at 18,077 tonnes. This has grown to an impressive 639,648 tonnes in 2017, 13% up from the previous year, and their target is 800,000 tonnes by 2020.[25]

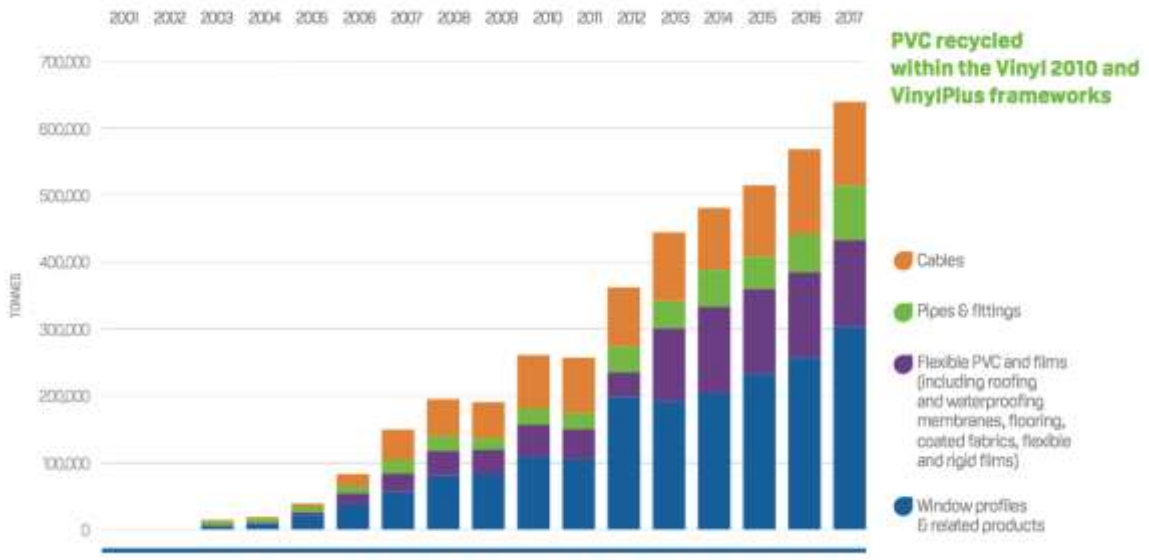

Figure 12 PVC recycled in Europe, 2001-2017

With the EU Commission's requirement for a pledge of 10M tonnes reused in Europe by 2025, from the collective supply chains in the plastics industry, VinylPlus is confident they can pledge a realistic figure and commitment.

At the time of my visit, VinylPlus was doing detailed analysis on their pledge and plan. Based on market knowledge and quantities sold and currently recovered by product type and nation state, they were assessing both recovery and reuse issues, supply chains, opportunities in sectors such as:

- Windows
- Pipe
- Flooring, etc.

The challenge for vinyl is that the dominant collections across EU member states are for packaging, and PVC is a small fraction, only 9% of the packaging market at 5M tonnes. Given 1/3 of that is used to wrap cheese, and 2/3 blister pack for pharmaceuticals, VinylPlus estimates only 5% (around 250,000 tonnes) is recoverable. They think the greatest areas for opportunity, given market trends, are still via the building and construction sectors.

The challenge for all polymer supply chains is the question of chemical and mechanical compatibility of recovered material with end markets requirements. For this reason, it is highly advantageous that the vinyl industry has been switching to more environmentally friendly additives in product sold into the market for over a decade, meaning that there are less problematic legacy issues and more product can be recovered and reprocessed than otherwise.

[25] https://www.recovinyl.com/news/plastics-recycling-show-europe-april-2018

4.2.6 Recovinyl

A major contributor to the high recycling rate of PVC in Europe was the formation of Recovinyl in 2003 by the industry. This entity, like a product stewardship program, is not-for-profit and funded by industry via levies.

Its role at the time of formation was to assist improve production processes, minimise emissions, develop recycling technology and boost the collection and reprocessing of PVC. It succeeded lifting recycling, contributing 240,000 tonnes to the total PVC recycling quantity in 2010, and in 2011 its role was revised and amped up.

In 2011 the industry decided it was necessary to be more active in addressing the quantity and quality of recycled material reprocessed in Europe. The organisation now is more like a broker, mediating between recyclers and converters establishing trustworthy relationships and material flows using a recyclate certification system.

Figure 12 shows the extraordinary growth rate achieved by collective industry investment and collaboration, along with such supporting initiatives as government bans of plastics to landfill.

4.2.7 EU Manufacturers Expanded Polystyrene Association (EPSMA)

Airpop Brand Manager, Secretary General, Annette Schaffer

Unfortunately this association has far less information and data, management structures and systems established for recovery of EPS in EU than the vinyl supply chain.

At the time of our meeting in May the association was working hard to collect more robust data on tonnages out of and into different applications in order to be able to form a plan and pledge. They estimate that currently 200,000 tonnes of PS insulation arises from demolition sites across the EU each year and rising, but they do not have annual surveys or data reports to verify this or other uses.

In all its applications (insulation, bulk formwork and packaging) PS is a highly dispersed and light weight polymer. As in Australia, challenges arise around the business case for transport and reprocessing. Consequently the association was concerned they would find it difficult to recover sufficient material to contribute meaningful weight (vs volume) to the overall pledge target.

Like the EU vinyl industry, the PS industry had phased out use of hazardous chemicals, in particular HBDC (used as a fire retardant chemical), however, only in 2016. This meant that there was going to be a big wave of contaminated material coming out for recovery in coming years which would hinder them being able to contribute significantly to the EU Commission's pledge.

Accordingly, the industry is pursuing and investing in a range of ventures for collection and treatment of EPS for recovery and reuse. This included negotiation for the recognition by the Basil Convention General Technical Guidelines of PolyStyreneLoop dissolution process as a valid pretreatment for the separation of PS and HBCD.

This was assisted by the formation in 2017 of the PolyStyreneLoop Cooperative, funded by the PS supply chain with a grant from the EU and loan from RABO bank, to build and operate a plant in Netherlands to process insulation in Amsterdam.[26] Launched in November 2017, the plant aims to demonstrate the economic and technical viability of closed-loop recycling.

Likewise the association is also looking at modular on-site chemical treatment systems developed in Canada to dissolve PS and to remove HBDC from recovered polymers. This might improve the

[26] https://polystyreneloop.org/

Figure 13 Polystyvert technology for EPS

economic viability of transporting PS. However, Polystyvert is still in pilot development phase seeking patents.[27]

While these ventures might prove successful, they may be too late, and there is a possibility that most sectors and applications will phase out use of PS, substituting it for other materials such as glass fibre and mineral wool in insulation. PS may continue to be used in a few niche applications.

How these ventures progress and this polymer supply chain responds to the EU Commission's pledge over the next 2-3 years will be critical to its future.

4.2.8 World Wide Fund for Nature (WWF)

Oceans Team: MPA and MSP Policy Coordinator, Janica Borg and Communications Officer, Marine, Larissa Milo-Dale

Aside from learning a great deal about the collaborations between global and regional offices in WWF, and with other organisations, the key observations out of our conversation were:

1. Plastics in the environment is becoming as critical an issue as climate change. The persistence of the material, its decomposition into tiny particles and micro-particles killing wildlife and entering the food chain is a major concern.
2. They are concerned there is no fund or mechanism for clean-up of the plastics in the environment; this needs changing as it is currently borne by the public purse and the environment
3. Single-use plastics are the main focus for attention
4. There is too much confusion around the diverse array of biodegradable plastics and when they should be used, and this needs to be addressed as a matter of urgency.

The WWF team were pleased with the direction of the CE Plastics Strategy as it aligned with a number of their concerns, and it is interesting to see that some of their points are also shared with industry groups such as EuPC.

At the time of our meeting they were working on their document (later launched on World Environment Day, 8 June) entitled '*Out of the Plastic Trap; Saving the Mediterranean from plastic pollution'*.[28] This document tracks increasing levels of plastic to 2025 and 2050 on current rates of use and litter.

The WWF calls it a global emergency and includes 20 recommended actions for global and national governments, industry and individuals, which includes the following three recommendations:

[27] http://www.polystyvert.com/en/our-technology/
[28] http://awsassets.panda.org/downloads/a4_plastics_med_web_08june_new.pdf

- Endorse a legally binding international agreement to eliminate plastic discharge into the oceans, with binding national reduction targets, a monitoring and evaluation framework and a financial mechanism supporting implementation.
- Adopt international trade regulations for plastic waste that define recycling criteria for exporters of plastic waste. Establish producer responsibility schemes for all plastic products on the market, including the development of deposit and other schemes where relevant.
- Move from the current target of 30% of plastic waste recycled and reusable to 100% by 2030. Separate collection targets should be established for relevant extended producer responsibility systems (e.g. lower fees for recyclable packaging or for the use of recycled materials) as well as deposit funds.

Other recommendations include use of alternative materials, redesign supply chains to allow use of recycled materials, incentives for systemic shifts to reduce production of waste and enable recovery.

They told me how environmental groups around the world are uniting calling for 'plastic free oceans' linking up with sporting groups, mainstream media, and other voices/outlets. This will be launched after September 2018. After that, in October they will be going to the UN Environment Assembly calling for a globally binding agreement to limit plastic pollution in the ocean.

Given the consistency with the direction of the EU Commission, single use plastic items are facing a limited future.

4.2.9 Confederation of European Waste to Energy Plants (CEWEP) (incinerators)

Policy Officer, Maxime Pernal

Figure 14 The waste incinerator in Brussels

CEWEP has 30 member companies operating nearly 500 W2E incineration plants in 23 countries (the association does not represent companies in organic W2E sector of anaerobic digestion or landfill gas or other waste type facilities). The number vary between countries, with Hungary only having one plant, Greece none, Italy 40 and France 126, and this is often a reflection of landfill availability/use, and the industrial development of the country (very few ex-Soviet-block countries have incinerators).[29]

In addition to learning about the structure and history of CEWEP, I learned the following:

- The industry is concerned about the viability of plants given the EU Commission Circular Economy Strategies, waste reduction targets, and requirement that all member states have bio-waste separately collected or recycled at source by 2023
- Given these changes, plus the EU Commission no longer endorsing and funding incineration to the same extent as before and the phasing out of the fixed feed-in tariff for generated energy, the industry anticipates few new facilities will be built in Europe in the future
- Plants vary widely in their efficiency and electricity/heat output. 50% of plants are run and owned by municipal governments, often as separately managed entities (like AEB in Amsterdam)
- CEWEP member plants incinerate and most also recover heat to improve their viability; some are co-located with industrial processing plants, ie chemical plants. Apparently there is one

[29] http://www.cewep.eu/interactive-map/

plant in EU that converts the heat to coolth for both district heating and cooling, however, I could not verify if the noted Barcelona plant did this.

- There is growing concern in some countries and communities about the emissions and suitability of these plants, even where they have been operating for some time, although there is no issue in Nordic countries. The association states that emission standards for W2E is stricter than for coal-fired power plants, and this is necessary given the largely unsorted inputs.

For more on Incineration facilities see 5.2.1 on AEB Amsterdam.

4.2.10 EPEA Internationale Umweltforschung - *Cradle to Cradle* and *The Upcycle*

Business Development Manager, Tom Koch and
Business Development and Communication, Niklas Jonas

Established by Michael Braungart in Hamburg, EPEA is a global consulting firm at the forefront of environmentally positive product labelling. The firm works with brand owners and companies providing the most environmentally stringent labelling accreditation for products in the world.[30]

Michael Braungart is also famous co-author of two seminal books with William McDonaugh from US, entitled *Cradle to Cradle,* 2002 and *The Upcycle,* 2013.

The C2C accreditation system comprises a 0-10 score across 5 criteria for all products, with the lowest criteria score determining the final score. This means that products/packaging owners get to see clearly areas for improvement, which may include banning substances, phase out poor design, etc. There are 12 companies licensed to do the assessments, and APEA is the largest. 8,000 products have now been certified for 260 companies around the world; none based in Australia, but some sold into Australia. Compliant products gain a certificate (from 5 levels from Basic to Platinum status), and the company also obtains a certificate for use with suppliers and customers.

Whether assessing a T-shirt, plastic bottle, lamps, window frames or clutch pressure plate the material, product and process assessments cover use, impact, design, disassembly, toxicity at all stages in the life cycle:

1. Material health
2. Material reutilization
3. Energy
4. Water
5. Social fairness.

EPEA calls for better standards, saying that we are currently doing 'primitive recycling', and handling complex products of many parts is very difficult. They gave an example of a heater that was impossible to fix without breaking, and a yoghurt container that is made from a polymer that cannot be recycled. While both were functional they have major faults in their inability to have ongoing useful life.

I noted that EPEA and others assessors have certified 8,000 products but that this is unlikely to keep up with new products entering the global market. It was clear that EPEA is at the forefront of the movement to influence companies to change products for no-harm and showing what is possible, and this is influencing the EU Commission. The C2C program goes beyond EU's REACH (which is just chemical composition) to holistic review of the composition, functionality and lifecycle of a product.

I learned of other useful activities of EPEA including:

- Sustainability strategies for regional governments and brand owners

[30] https://www.epea.com/scientific-foundation/

- Strategic innovation, such as the 'Buildings as material banks' and Paper and printing sector programs.

Having heard about the Buildings as Material Banks project in the Netherlands, I realised this was a new global development in building design and deconstruction.[31] As a sophisticated 16 company consortium undertaking a multi-year EU Commission €10M funded project across seven countries, they are investigating two areas:

- 'Materials Passport' to define criteria and method for tracking materials via a RIF code or chip, to stop making waste out of buildings
- 'Reversible design' that optimizes building structure, to separate the various fractions for reuse, and reduce virgin material demand.

(See next page for more information.)

[31] https://www.bamb2020.eu/

5 NETHERLANDS

5.1 NETHERLANDS CIRCULAR ECONOMY STRATEGY

Netherlands Government, Ministry for Infrastructure and the Environment, Deputy Head of Circular Economy Unit, Mari van Druemel

The Dutch are united in their commitment to sustainability. With sizeable population in a small land area, 50% of which is below sea level, the Netherlands government, industry and community work purposefully to manage water, land, resources and energy. The Waste Hierarchy was integrated via legislation in 1994 and they have adopted circular economy as a core revision of their systems for environmental, social (jobs) and economic benefits.

In 2016 the Netherlands national government adopted its government-wide Programme for A Circular Economy to 2050 with a range of stretch targets, which includes an interim target of 50% reduction in use of primary raw materials by 2030:
"The Cabinet wants to outline a vision of a future-proof, sustainable economy for us and for future generations. In concrete terms, this means that by 2050 raw materials will be used and reused efficiently without any harmful emissions into the environment." [32.]

This CE strategy and document was developed by four key government departments collaborating, namely Infrastructure and Water Management, Economic Affairs and Climate Policy, Interior (Home Secretary) and Foreign Affairs. The national government in power is a coalition of four parties, three of whom strongly support the strategy and programs.

The reasons for cross-party support are the alignment of jobs, economic resilience via innovation and improved national independence from imported and scarce product and materials, and environmental benefits particularly lower resource use, waste and CO2 emissions. A number of preparatory reports were commissioned on both CO2 emission reductions and jobs to assess the impact, costs and benefits from the proposed changes and inform debate and the priorities in the CE program. The Netherlands Government is now working on ways to involve all three levels of government and industry in the implementation.

The strategy has been well received, particularly by environmental groups and the business community who appreciate that the driving force is stimulation not only compulsion. It is leading to the formation of innovative approaches. I noted that there is a high level of acceptance of the role of government in enterprise, regulation, investment and driving change in Netherlands.

There are a few examples which were provided during the meeting with Mari van Druemel that are a result of the Circular Economy Programme.

1. The cement industry has formed a voluntary covenant with the government, such that all concrete will have 100% content by 2030. This means that they will phase out the current practice of including recycled glass from TV screens from the UK to ensure that in future cement can go back into cement.
2. The commercial building property sector is collaborating with the Netherlands government and EU Commission, with the support of EPEA (Michael Braungart's team) to design a framework such that the builder owns and leases the façade, and is able to replace it with improved and more efficient walls, windows, insulation for improved occupant comfort and lower CO2 emissions. The Dutch property sector already practices highly efficient disassembly

[32] https://www.government.nl/documents/policy-notes/2016/09/14/a-circular-economy-in-the-netherlands-by-2050, pg 5.

and refurbishment of buildings, and this takes it to a new level. Challenges to address include insurance and depreciation calculations (see previous page for more information).

3. The Netherlands government is investing with business in an internationally significant project. This plastics plant is a joint venture between them, the Port of Amsterdam and Bin2 Barrel and will take 5,000 tonnes of residual plastic waste in its first year using an innovative chemical treatment to make and sell 30 million litres of cargo ship fuel, emit 80% less CO2e and also establish this technology for export around the world.[33] The Port of Amsterdam is a publicly limited company with the City of Amsterdam as the sole shareholder.[34]

These three examples also illustrate that the Dutch have enjoyed significant prosperity through the centuries through proactive partnerships and joint-ventures between government corporations and private sector, and they are now shifting to a more productive, resilient and circular economy.

5.1.1 Circular Economy Engagement and Procurement

Netherlands Ministry of Infrastructure and Water Management, Strategic Advisor Circular Procurement, Joan Prummel and Senior Advisor Resource Efficiency, Cuno van Geet

The Netherlands Government has established two five person teams to accelerate adoption of circular economy by both government and other entities. I was delighted to meet Joan Prummel and his colleague Cuno van Geet who were clear that 'recycling' is an important part, but that sustainable procurement was about a structural shift to more efficient business models.

Their program PIANOo has been independently reviewed by Mervyn Jones, Sustainable Resource in UK (see Section 8.2.1.2).

1. Green Deal. Established in 2013, this program and team has worked with 45 entities and produced 100 case studies.
2. Facilitators/trainers. This team engages with brands, companies and entities on circular economy procurement and strategies. They run workshops on how companies can reassess their business models moving from selling products to selling a circular service with minimal waste, integrate circular procurement into tenders. They have created a growing community of practice with five general forums per year, and also now for specific sectors to bring about structural shifts in supply chains. Companies have found it opens up additional efficiencies and business opportunities, rather than costs.

Since 2011 the Netherlands Government has been introducing sustainable procurement into its tenders, and companies involved get special recognition.

It was fascinating to hear how the program started and has grown over time, with minimal funds during the GFC and how they are enabling change. We discussed the role of category managers in major corporate brands, who is best to engage, and initial perceptions that there is a greater cost for more sustainable procurement.

5.1.2 Landfills and recycling

Land is precious and is intensively used for food and export crops, industry, towns and cities. Public protests over pollution in the 1970s, led the Netherlands to be the first country in EU to ban material and products from landfills and undertake wholesale closure of landfills. Records show that there were between 4,000-6,000 landfill sites across the Netherlands, and over 1600 were operational when the first landfill directive was introduced in 1980 to address soil pollution. Subsequent Acts addressed

[33] https://www.unenvironment.org/news-and-stories/story/powering-ships-plastic-amsterdam
[34] https://www.portofamsterdam.com/en

soil protection, the waste management hierarchy, and bans for materials where there was a better treatment/technology available.

By 1994 the separate collection of organic household (food and garden) became mandatory, this was followed in 1995 with bans for 35 categories along with a landfill tax. This mix of measures (bans where there are alternative treatments) led to innovation and considerable diversion of material from landfill. This was followed in 1996 with a national Act for the closure of non-sanitary landfills. In 2010 the Netherlands Government required compulsory separate collection of plastics (all plastics).

There are now landfill bans on 61 categories and only 22 landfills operate in the Netherlands receiving hazardous waste only, such as asbestos. Previously a national responsibility, landfills are the responsibility of provincial authorities, operate at a loss and require subsidy.

It has not always been easy, but the Netherlands has achieved these results as a result of a dual strategy - combining bans with landfill closures, and incentives for innovation where required.

5.1.3 Packaging collections

Nedvang, past-Managing Director, Joris van der Meulen (Director, Elum Consultancy)
Nedvang, Managing Director, Marchel van de Grift
VPKT, Director, Tjaco Twigt.

The Netherlands has a different approach to Australia for packaging and for residential collections and has a limited container deposit scheme for PET beverage containers (>1litre). All packaging collections and packaging related activities are coordinated through and in collaboration with Afvalfonds Verpakkingen (Packaging Waste Fund) and different levels of government.

Firstly, all companies putting packaging in the Netherlands market contribute a fee that covers much of the cost of a suite of related organisations and services, most especially the cost of collection and recycling borne by municipalities. In Australia companies producing packaging contribute enough funds to pay for the operation of the Australian Packaging Covenant Organisation (APCO), no more.

Afvalfonds manages the €250M fund (revenue in 2017) to meet the extended producer responsibilities set out in the Dutch Packaging Decree and Packaging Agreement. As a not-for-profit organisation, with an industry board, Afvalfonds 'focus(es) on the coordination and implementation of various tasks such as:

- establishing and maintaining a waste management system to achieve national recycling targets;
- working with municipalities and other parties to compensate for the collection or processing of (separated) waste packaging;
- the minimisation of packaging litter;
- monitoring and reporting on the usage, collection, and re-use of packaging materials; and
- establishing the rates, and collecting contributions from producers and importers.'[35]

The structure of these related entities can be described as follows with these functions:

1. Nederland Schoon – prevention of packaging litter, €21 M to municipalities
2. Nedvang:
    - Register of all packaging in the market
    - Monitoring of packaging collections
    - Negotiation on behalf of 380 municipalities of standard packaging collections by collectors and delivery to accredited sorting facilities
3. Verpakkingsketen (VPKT) – supporting sorting and reprocessing of packaging.

[35] https://afvalfondsverpakkingen.nl/en/packaging-waste-fund

4. Netherlands Institute for Sustainable Packaging (KIDV) – knowledge sharing on sustainable packaging and prevention of poor packaging (following the Waste Hierarchy)

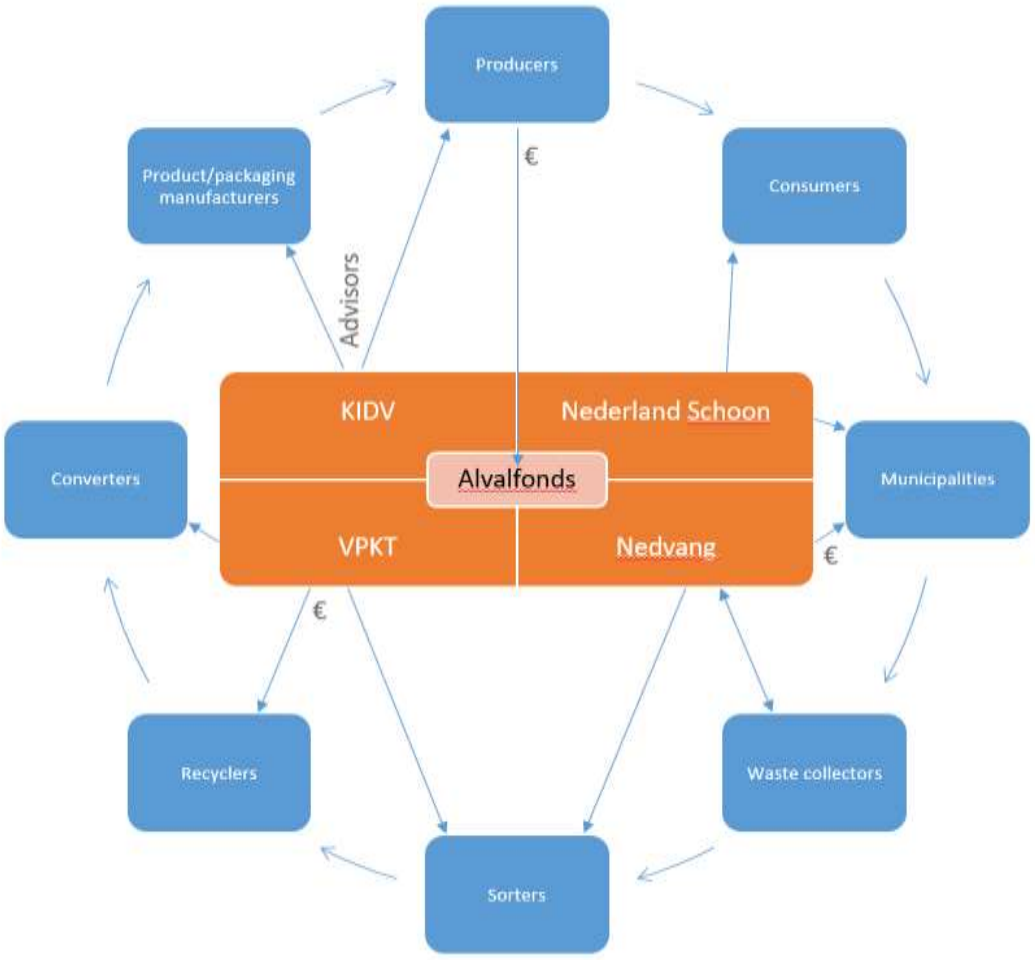

Figure 15 Diagram showing the relationship between Packaging entities and the whole supply chain, Netherlands

Figure 15 shows that Afvalfonds plays an active strategic role with four interrelated entities in collaborating with industry and governments in the supply chain with incisive projects and activities to reach packaging recycling targets. It was impressive to hear about the data, measurement and discussions that go on that identify ways to tackle blockages. Indeed such discussions led to the recent establishment of VPKT, and major injection in 2017-18 of €150M for plastics.

Material	Result 2016	Result 2015	Target EU 2016	Target NL 2016
Paper and cardboard	**85%**	85%	60%	75%
Glass	**84%**	83%	60%	90%
Plastic	**51%**	50%	22,5%	46%
Metal	**95%**	95%	50%	85%
Wood	**51%**	48%	15%	33%
Total recycling	***73%***	*72%*	*55%*	*70%*

Figure 16 Packaging recycling targets and results for Netherlands and EU, 2016 [36]

[36] https://afvalfondsverpakkingen.nl/en/packaging-waste-fund

The Netherlands achieves an astonishingly high recycling rate across all packaging material types and succeeds in exceeding its own targets in most areas. This is something for us to aspire to reach in Australia and Asia.

5.1.3.1 Netherlands Kerbside and Residential Collections

The Dutch do not have general waste collections or comingled recycling bin collections from their homes like we do in Australia. Householders practice high levels of separation with different bins and systems for different items. This provides high quality, well separated material into sorting and reprocessing facilities so they can reach high recycling rates.

Bins/crates in the home:

- Plastics/beverage cartons and metal beverage cans
- Packaging glass
- Paper & cardboard
- Organics.

General waste is deposited by householders into a discrete bin located in their street, and it is called 'Residual'. Once all the typical things are separated in the home there is very little left. There is talk of households being issued with a key pass so that they have to swipe to deposit in the residual bin, maybe €50 for first 100kg and rising thereafter.

Cost per household for these collections varies between municipalities €34 to €395 per year.

Figure 17 Residual waste (Restafal) bins in street in Amsterdam

5.2 Dutch Energy Supply and Demand

Energy and climate change policy and strategy was not a focus of my Churchill tour, nevertheless, it arose in a number of areas. It was unavoidable especially because the Netherlands Government had just announced in March 2018 the premature closure of the giant Groningen gas field.

The subject of much debate for many years, this gas field, the largest in the European Union and one of the largest in the world has been a major revenue stream to the country since 1960s. Gas has been sold to heat homes and supply industry for production of energy, chemicals, pharmaceuticals and plastics in the Netherlands, France, Belgium and Germany for decades. It underpins much of the high-value value-added industries of the Netherlands, and its energy independence.

However, extraction has resulted in low-magnitude earthquakes damaging thousands of homes and buildings. Gas extraction rates have been slashed and now the field will be closed by 2030. This has major ramifications for the economy immediately and long term and so the Dutch are particularly intent in pursuing innovation, new revenue streams, investments, efficiency, alternative energy and a circular economy.

At this stage this does not mean that the Netherlands Government will be building new incineration plants, whereas they are investing in further separation and treatment of plastic and chemical material streams away from incinerators or from incinerator flues to extract greater value.

As a result of organic diversion from landfill since 1994 there are many composting facilities however, few biogas and anaerobic digestion facilities in the Netherlands, due to high reliance on the Groningen gas field. There are also 11 incineration plants handling combustible material.

The 2017 Energy Plan is to have zero greenhouse gas emissions from the Netherlands by 2050, with 14% of all energy used from sustainable sources by 2020. This is inclusive of transport and all users of energy, not just the electricity network (as in Australia).

5.2.1 AEB Incinerator, Amsterdam

Strategic Advisor, Peter Simoes, and
Strategic Advisor Plastics Plant, Edward Iemenshot

Incineration has been used as a waste solution for over a century in Netherlands, and with significant investments, incineration has also become an energy (electricity and heat) generation source.

Joris van der Meulen organised some excellent site tours, and our first was to AEB Amsterdam Waste to energy plant incinerator, one of 11 in the Netherlands. It is generating over 1million MW electricity p/a (enough for 250,000 homes) with total incineration capacity of 1.400.000 tonnes. Trucks deliver the material from across the Amsterdam region (around 350,000 households) and ~25% is imported from UK to feed the plant and the turbines. Gate fees are low at €70-75/tonne (equivalent to <$119 Aust/tonne).

AEB has operated incinerators since 1917 for Amsterdam, with this waste to energy plant established at the Amsterdam Port in 1993. It is a fully owned business of the City of Amsterdam with 19 municipality partners. It is the largest W2E single location plant in the world and largest renewable energy plant in Amsterdam. The 4th generation plant upgrade was completed in 2007 at around €450M. AEB has invested in optimising emission scrubbers that filter and extract particulates, ensuring that the plant operates well inside the emission requirements set by the Netherlands Environmental Assessment Agency and public expectations.

The AEB team are proud of their finely tuned facility which has the highest energy efficiency in the world at >30%, stating that most incinerators around the world average 15% and some as low as 5%, with higher particulate emissions.

AEB has teamed up with key partners (Amsterdam Port, the water authority and national government) in developing further productivity plans for greater industrial symbiosis in the port:

1. To extract more from the incoming material stream (in particular the plastics) and set up new plastics reprocessing
2. Recover even more valuable chemical elements from the particulate emissions
3. Recover more heat for further district heating.

This sophisticated investment and pursuit of value takes place because Dutch laws require pursuit of the waste hierarchy, and the facilities are government owned-enterprises pursuing shared objectives in a cooperative manner. There is capacity in their arrangements to negotiate changes to feedstock, higher efficiency outcomes and public benefit.

On the issue of incinerators, experts in the Netherlands advocate that Australia avoid building incinerators as the main treatment for household waste. They report that incinerators become a disturbing factor competing with recyclers and inhibit recycling, industry development and a more circular economy.

5.3 PLASTIC REPROCESSOR – VAN WERVEN

Managing Director, Ton van der Giessen and team

Later that same day we visited the large plastics sorting facility of family owned business Van Werven. They are a rare plastics recycler in the world and a sign of the future in recycling. They were a winner in the EU Plastics Recycling Awards and Managing Director Ton van der Giessen presented at the Amsterdam Expo. He is also Chair of *Holland Circular Hotspot* – a new venture to export Dutch knowledge.

Figure 18 Tour of Van Werven, separation bays and expert picking line for 25 types of rigid plastics

Van Werven receive, sort and reprocess only rigid plastic, no soft plastics, and unusually they deal with all types – including polyolefins, speciality plastics *and* vinyl, totalling 25 different polymers. Van Werven accept material from industry, sorting facilities and the difficult one of post-consumer products, such as from council drop off facilities. They do not do pick up; all material is delivered to their sites and they pay according to quality of separation. Deliveries of mixed material is sorted by both picking machine and by hand by teams of men who know the 25 plastics, and for this reason Van Werven obtains 98% consistency and a good price for the finished product. The business is one of the growing number of EuCertPlast certified plastics recyclers (see section 4.2.3).

Interestingly, as Van der Giessen explained, they intentionally operate outside the realm of extended producer programs and subsidised programs which may fluctuate in government funding. They have built this business in the Netherlands because plastics are banned from landfill, and subject to rising recycling targets which diverts plastics from incinerators.

Van Werven has a strong business with three complimentary divisions using shared plant and equipment: earthmoving equipment hire, organics composting treatment and plastics recycling. As a privately owned family company, they are growing with plastics sorting facilities now operating in UK (2012), Belgium, North Ireland, Sweden and opening Poland in 2019.

They currently process 120,000 tonnes p/a and plan to reach 200,000 tonnes by 2020 and have 20 major customers for their reprocessed plastics, with a handful of smaller ones.

Van der Giessen has been careful to establish consistent suppliers and regular satisfied customers and will not receive material without a customer in mind. As in Australia with similar companies, in their QA testing lab each batch of reprocessed plastic is tested before delivery to customers with detail MSDS produced showing the chemical composition and properties. Van Werven is positioned as supplier of recyclate that is a substitute for virgin feedstock. They do not do compounding, colouring etc, they produce a consistent material for their customers who do the compounding for different product formulations. Their plastics are used in the making of vacuum cleaners, pipe, window frames, containers and also in the automobile industry.

A major milestone was in 2017 when Van der Giessen successfully reached agreement with the European Commission to gain recognition as the first plastics recycler in Europe with a Green Deal. This means that material leaving his site is not classified as a 'waste' but a 'resource' for customers. This was achieved with vinyl (PVC) plastic, and he plans to gain similar approvals for other polymers. This removes a major constraint of classifications of material and onerous paperwork for his manufacturing customers.

Van Werven is a successful and growing business with a good business model and Van der Giessen sees the China ban as a bonus for plastics recycling, reprocessing and manufacturing in Europe, it also contributes to lower emissions (recycling plastics cuts emissions by 75%). He fervently believes used plastics should be reprocessed locally, not exported as 'waste' to be someone's problem overseas.

Figure 19 The fully utilized site amidst farmland with plastics separation bays and plant with adjoining compost operation

6 GERMANY

6.1 CIRCULAR ECONOMY STRATEGY

Like the Netherlands, Germany has embraced the principles and strategy of the circular economy at federal and state levels. There is sophisticated and coordinated debate across Germany, with several levels of government and industry presenting challenges and opportunities at IFAT.

The German Government banned household waste from landfill in 2004 in line with EU legislation, and only mineral waste such as asbestos and ash from incineration plants goes to landfills. The German Circular Economy Act came into force in June 2012, bringing their Waste Framework Directive into law. Core principles include the waste hierarchy, polluter pays, shared public and private responsibility for waste management.

Publications and 2017 data from the Federal Statistical Office show that Germany's policies and strategies have successfully decoupled growth from waste volumes.[37] [38]

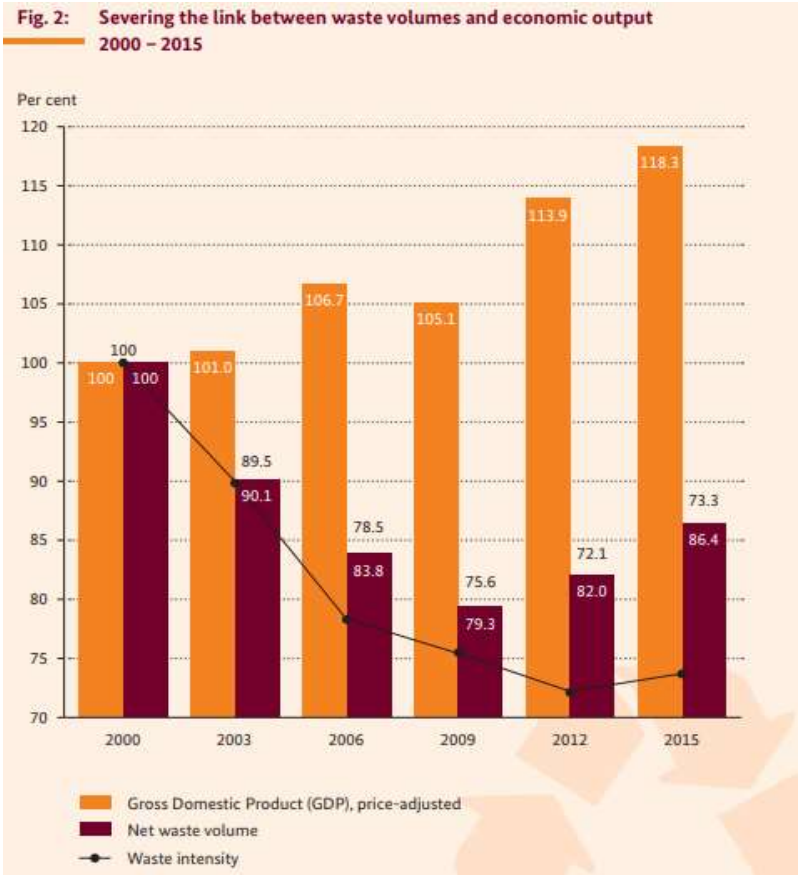

Figure 20 Decoupling waste from growth (source Waste Management in Germany 2018)

As part of its strategy of progressively increasing recycling, the German Government revised the Ordinance on the Management of Waste (Municipal, Commercial and Construction and Demolition) in April 2017.[39] This was introduced largely because there was very low, 7%, recovery from commercial businesses. There has been some consternation particularly at the number of bins required for sorting on demolition and construction sites. There are other initiatives in the pipeline, including the proposed review of the Waste Prevention Program in 2019.

[37] https://www.bmu.de/en/publication/abfallwirtschaft-in-deutschland-2018/, p 9.
[38] http://www.oecd.org/cfe/regional-policy/Country-statistics-profile-Germany.pdf
[39] https://www.gesetze-im-internet.de/gewabfv_2017/BJNR089600017.html

Like the Netherlands, the German Government sees resource efficiency and circular economy expertise and equipment as exportable services and revenue to Germany. It is no accident that IFAT is held in Munich, Germany and features German expertise, equipment, businesses, governments and institutions.

6.2 HAMBURG CHAMBER OF COMMERCE (HANDELSKAMMER HAMBURG)

Industry, Energy and Environment Policy Officer, Isabel Ihde

The Chambers of Commerce form an important part of the fabric of German discourse and development of policy, strategy and German business development. They have a broader membership and remit in Germany than in Australia.

Firstly, all legally registered companies are compulsorily members of their local chamber. Small start-ups and sole/tiny businesses have free membership, whereas large companies pay considerably more. Secondly, Chambers are also the responsible arm (by Federal law) for delivery of vocational industry training and apprenticeships. This guarantees they have a key role to play in the ongoing health and professional development of their members and industries.

Consequently Hamburg chamber, one of the largest in Germany, has 167,000 members, 700 people serving voluntarily on chamber committees and 260 employees. Other services offered range from assistance with writing business plans, identifying relevant laws to many networking events.

The German Chambers of Commerce also cooperate on shared policy, strategy and advocacy, with three staff on the Climate Policy area alone. The Chamber has a very close working relationship with the City of Hamburg, with program delivery on energy productivity and clean tech innovation financed by the City (three year contract).

Isobel Ihde, Industry, Energy and Environment Policy Officer, is one of a team of six (three each in policy and program delivery). This increased staffing is to address the increase in legislation, number of businesses and drive for improved productivity in the in Cleantech sector. While not the largest, this sector has grown 20% since 2012.

Figure 21 The stately office of the Hamburg Chamber of Commerce

The Chamber now has around 2,500 members in the Cleantech sector (renewable energy, water treatment, material efficiency, product development, consultancy services etc). Growth trends are undeniable. Currently 53,000 employees (60% growth since 2012), with 80% less than 10 employees, and 73% expecting continued growth. Nearly 20% of these businesses are in waste, recycling and water management. The Chamber produces multilingual brochures on the Green Technologies sector.

In terms of the position of the Hamburg Chamber re climate change and circular economy, the organisation is fully committed to both, seeing federal and state requirements as a driver for innovation, growth and competitive advantage in EU and globally, as well as negotiating issues such as increased reporting requirements and transition funding.

The Chamber has regular quarterly member forums on energy, environment and industry and they are driving increased research and business development opportunities. Sample projects include:

- Hamburg Eco-Partnership – improved eco-balance of companies (heating, cooling, illumination etc), financial support for environmental management systems, etc to save 150 tonnes CO2 p/yr

- Sustainable Building – Federal government target for carbon neutral buildings by 2050, via energy savings, refurbishment of buildings, improved urban planning, eco-labels for sustainable buildings etc
- Norddeutsche EnergieWende 4.0 (North Germany Energy Transition) – Consortium of 50 partners across two regions to pursue sustainable energy supply
- Electric Mobility Pilot region – market stimulating activities by the chamber, 600 charging stations, special project with 820 e-vehicles in business community.Recycling Offensive Hamburg – project led by Hamburg state government and housing sector to increase separation of organics, plastics, metals, paper etc in the home.

Isobel provided data which showed that recycled material in Hamburg has displaced 14% raw material use in 2016 (up from 2% in 2001) with estimated reduced 18M tonnes CO2 p/yr.

We concluded our meeting discussing the Sustainable Procurement framework adopted by the City of Hamburg which is assisting drive change.

6.3 BESTSORT (BUHCK UMWELTSERVICES, PART OF THE BUHCK GRUPPE)

Project Manager, Ingo Recker and
Material Management and Sales, Benjamin Deckert

Buhck Gruppe is a fourth-generation family-owned company established in 1899 comprising now 28 subsidiaries operating across the region of Hamburg. Starting out with classical waste disposal business of collection services and landfills, the company has diversified into services such as canal control and cleaning as well as material sorting. The Buhck Gruppe now has 750 employees.

Best Sort is a 100% owned sorting facility established in 2006 with a €13M investment in the site, equipment and weighbridge. It is located in an industrial area of Hamburg. There are 35 employees on site processing around 80,000 tonnes per year (25 tonnes/hr), and this includes several on sorting equipment, picking lines, baling, site management and sales. All material is delivered under contract with specific collectors, and removed by truck to specific customers.

Best Sort only receive commercial and industrial recyclable material for which there are no separate collections. This means they receive IBC containers, wooden pallets, plastic bags, some paper and cardboard and occasional mattresses. They do not receive deliveries containing food, beverage containers, clothing, batteries, ewaste, etc for which there are separate collections/drop off points.

While there was dust, there was little odour and no broken glass, crunching aggregate, batteries or products/materials that do great damage to the equipment and mechanical parts.

Best Sort estimates recovery is around 30% (24,000 tonnes), predominantly of metal, paper/cardboard and rigid plastics sold to customers, with remaining 56,000 tonnes finely processed to become RDF (refuse derived fuel) for incineration for cement works. Equipment on site include shredders, optical sorting, sieves for different sized fractions, raised sorting room with conveyers and drop chutes.

They are adjusting to China's ban, with Benjamin saying his job is now more interesting. A great deal used to go to China, and now 100% of paper and plastic is used in Germany. They had some challenges with stockpiled paper/card material building up in the warehouse. He is now exploring further opportunities with timber. In terms of process flow, I was surprised that they placed the shredder before the picking lines.

Figure 22 Delivery yard, picking room, conveying large fraction plastics, chutes and separated material, with Ingo Recker

Germany is much larger in area and population than the Netherlands. It also has greater disparity between municipalities and regions. Two cities, Hamburg and Berlin are municipalities and also states. There is no equivalent to Alvalfunds in Germany for coordination or collaboration. Indeed they have as many as five container deposit schemes competing in the same jurisdictions with labels, funds and administration management.

6.4 Public Drop-Off Facility, Nymphenburg. Abfallwirtschaftsbetreib Munchen

On our way to IFAT Expo one morning we took a detour to visit a nearby public drop off facility. It was easily accessed by tram with a line running past the front gate, in the middle of a suburb. Surrounded by leafy parkland, the recycling site was compact, clean and efficient at ~400m2. There are 14 such facilities in Munich run by the City of Munich accepting a wide range of items for free, meaning access and use of these facilities is very easy and low cost. All items must be properly separated into respective bins or compactors by the resident.

The spatial arrangement of the site is a big U with cars/vans/people unloading from the central area. Everything was carried by the resident to the relevant bin; no dropping a trailer load of mixed material onto the ground and shoveling into a skip! The site has a small site office and two staff with haz vests taking turns to assist on the ground ensuring correct separation and assisting people unload vehicles, and/or in office and on the phone coordinating pick-up of containers.

A key feature was the fact that nothing needed double handling on site. Items were all placed directly in the relevant container that was going to be the transport off the site. Some containers were accessed by steps and landings, others residents walked into the container to load items. A number were under a shade roof, others in the open, but all could be closed and locked at night or for transport.

At the site we visited we saw the following separated collections:

Car batteries	Timber	Fridges	Plastic waste
Ewaste and ewaste cable	Hard plastics (tables, chairs, toys)	Texiles and clothing	Plastic recyclables
Cable	Electric appliances (radios, speakers)	Furniture (compactor)	Green garden waste (compactor)
Mattresses	TV and monitors	Paper & Cardboard (compactor)	Metals

A 32pp detailed information booklet addresses most items from CDs to solar PV panels, including instructions on computer cable goes into the ewaste container, not the cable container.

There is also a pamphlet providing the dates and locations for the Hazardous Chemical Mobile van. Rather like the book library into country regions of Australia, each Munich community gets access to the van 14 times a year. Items that could be deposited with the van include paints, garden pesticides and medicines.

6.4.1.1 Residential recycling and waste services

There is a higher level of household sorting in Hamburg than Australia. Similar to the Netherlands some items are not included in household bins, most especially glass. As of 2015 households are meant to have separate collections for the following (estimated service fee ~€180 p/a):

- Household waste (fortnightly 80L bin)
- Paper (free fortnightly)
- Metals
- Plastics (free subsidized by Green Dot brand owner levies)
- Glass
- Organics.

Glass containers are deposited for free at 'Bottle Banks' that are located in shopping centre car parks, on street kerbsides etc. There are separate bins for clear vs green and brown glass and for paper.

Figure 23 Street bin banks for glass and for paper. Also the great breakfast debate on container deposit and recyclability

There is also the dual service of packaging deposit and refunds. While we paid the €0.25 cent deposit for a drink bottle, we did not see a refund machine in our travels in Hamburg. Whereas we did see people place containers worth a refund next to street bins so that poor people could pick up and get the refund. We certainly noticed 'bin-diving' in the streets of Hamburg.

Organics separation is widely practiced by households, and many food premises, parks and gardens facilities. German statistics indicate nearly 14 M tonnes of biodegradable material was treated in composting and/or digestion plants in 2015. Of this nearly 50% went to 868 composting facilities and

50% to 1,392 digestion plants. This astonishing quantity and treatment capacity resulted in nearly 4M tonnes of compost and 4M tonnes of substrate for fertiliser/soil additives.

7 BELGIUM

Belgium is small and compact like the Netherlands, but has hills. It is also virtually two countries joined together – Flanders and Wallonia, with the capital city Brussels in the middle. Brussels is truly multilingual with French, Flemish and Walloon spoken plus many other European languages as well as fluent English.[40]

Most of my time in Belgium was in meetings with the EU Commission and peak bodies for Europe (see Section 4 for comment on EU organisations).

Positively I had arranged an appointment with Fostplus regarding packaging recycling in Belgium and this proved useful to hear about their systems using see-through bags on the footpath (not in wheelie bins) or what they call 'bottle banks' or 'container parks'.

Figure 24 Bottle bank (white, green and brown separation) in street opposite EU Commission Directorate offices, Brussels

7.1 FOST PLUS – PACKAGING ORGANISATION AND COLLECTIONS

Account Manager Business, Ruth De Bruycker

Fost Plus has a similar role to that of Afvalfonds in the Netherlands; it has financial and contractual relations with the obliged companies, recycling companies and 31 inter-municipalities for the whole of Belgium. It promotes, coordinates and finances the selective collection, sorting and recycling of household packaging waste in Belgium. The collectors and sorters have the day to day relationships with the municipalities. There are no container deposit schemes or refunds for packaging in Belgium.

Quick off the mark, Fost Plus was formed the same year as the European Parliament and Commission approved the directive for packaging and packaging waste in 1994. Formed as a not-for-profit by the obliged companies that put packaging into the market, it was further developed in 1996 with a formal Agreement with inter-municipalities for the legal framework for the management of packaging. This was updated in 2008 to include recovery target of 90% and 80% recycling rate.

Obliged companies have two obligations – firstly information provision, and secondly take-back. The inter-municipalities can choose to collect and sort themselves or utilise subcontractors. Fost Plus' total budget of ~€130M comes from two sources: from member contributions and material sales. Fost Plus pays consistent rate for collection services whether it is public or private collectors and sorters in order to get best value. Collection contracts are revised every four years, and Fost Plus handles the sales for collected material, generally calling for tenders each year, but it has the capacity to negotiate between periods, ie with China's ban. Fost Plus is therefore also a broker/trader with commodities.

The cost of collections of packaging are virtually completely covered by Fost Plus' member contributions. Belgian residents pay a small fee for the transparent blue bags (€17 x 10 bags) for:

[40] https://www.oecd.org/regional/regional-policy/profile-Belgium.pdf

plastic bottles and flasks only, metal packaging and drink cartons. Paper and cardboard is separately collected in stacks or yellow bags, and glass is separately deposited in bottle banks (colour vs clear). All these three different collection systems are covered by Fost Plus.

In addition municipalities have separate kerbside green bag collection for garden organics, orange for food and white bags for general rubbish, and loose pickup for bulky items like furniture. They are very strict on what plastics can be recycled with yoghurt containers and margarine tubs not allowed in the plastics collection, only allowed in general waste.

It is a very manual system, with all items picked up from the footpath by workers wearing haz vests and gloves, and loaded into trucks. Often there are three people per vehicle, one driver and two collectors. The Fost Plus system creates jobs for ~2,500 people across Belgium.

Figure 25 Residential collections in Brussels' streets: food organics; general waste in white, plastics and metals in blue; cardboard only truck

Fost Plus records that it has 5,200 members declaring 780,000 tonnes of packaging each year, representing 92% of all packaging brought into the Belgian market. 90% of the packaging is collected and 92% recovered, avoiding 670,000 tonnes CO2 emissions p/yr.

Like the Afvalfonds system, the Fost Plus system has good data on quantities, collections, costs and destinations, although as Alexandre Dangis of EuPC noted, there is no plastics reprocessing plant in Belgium; all collected plastics are transported out of Belgium or incinerated. Fost Plus has a sales team dealing with arising material as commodities. Their team is not so focused on end market requirements and substitution of virgin material, as is the Dutch Afvalfonds program.

In recent years, Fost Plus has been expanding its services and undertaking trials. It invested €140M into two x 2-year projects with community partners employing six people to address litter with events and activities. The organisation has also decided to expand its collection program to address other plastic packaging formats of bags and blister packs.

It has undertaken a 2-year trial in Wallonia expanding what plastics can go into the blue bag, and from January 2019 it will roll out the new expanded service (all plastics packaging into the blue bag) over three years to the whole of Belgium. Simultaneously there are changes afoot in the sorting facilities with proposed closure of four, upgrade of the other six plants, as well as the introduction of some modular units for local pick up.

Fost Plus is also looking at further differential pricing for different materials. Currently there are eight material tariffs and this will expand to 15 to take into account different plastics. There is concern, however, that this differential is still too slight and complicated an instrument to influence brand owners in their material/packaging selection. The French system is apparently far clearer and also provides a financial incentive of 10% reduction in fees if the product contains a proven quantity of recycled content.

We discussed future developments for the organisation with the possibility of Fost Plus taking on some other collection schemes, and doing more to advise companies on eco-design that integrate circular economy principles and priorities. We ended our discussion with Ruth De Bruycker stating that they were relieved not to have the profusion and confusion of systems like in Germany, however, that there is pressure on politicians in Belgium to introduce a container deposit scheme, as in Germany.

7.2 EXPRA (Extended Producer Responsibility Alliance)

Regulatory and Public Affairs Manager, Monika Romenska

EXPRA is a 25 member umbrella organisation of predominantly European packaging producer responsibility schemes such as Fost Plus and Nedvang, with a few non-European organisations (Canada and Israel). They share insights, tactics and lessons from the operation of schemes, legislative frameworks and strategies on dealing with country and regional issues.

They take account of the wide diversity between member country economies, histories and geographies ie Turkey vs Netherlands vs Greece. They also share extensive knowledge of the wide diversity of packaging formats, compositions, collections and processing, ie multilayered plastic pouches, bottles and closures.

The role of EXPRA (exchange of knowledge and representation of members) has become more important given the Circular Economy Strategy and the CE Plastics Strategy of the EU Commission.

Monika and I met after the members had convened for a long two day workshop discussing the data and shifts that may be required for packaging schemes to meet the objectives and targets of the EU Commission. EXPRA sees the recent moves of the EU Commission as mainly positive, however that it will be difficult for some countries to meet the requirements, especially those with non-comprehensive schemes like Greece.

For example, they acknowledge that some schemes will have to introduce differentiated pricing for different packaging formats before March 2019. EXPRA is concerned at the increasing focus on CDS as a solution to litter, when most littering is a cultural habit and consequence of inadequate bins. CDS only address select containers, not such items as cigarette butts and balloons.

Monika was pleased at the new tighter definition and rules for EPR set in the EU Waste Directive and looks forward to the formation of common principles for variable pricing and the determination how schemes will help meet the EUC's pledge targets.

We shared stories of different collection systems and she was amazed that Australia uses a comingled kerbside collection system, like parts of the United Kingdom. She shared a memory of visiting a sophisticated glass facility in Netherlands where they sort into five colours for return of glass to glass bottle production, and how she would never forget "the soiled material from the UK's comingled collections which was little better than garbage".

8 ENGLAND AND UK

England, part of the United Kingdom, is an island apart from Europe with different laws, culture, geography and economy.[41] Brexit was never very far from the conversations and is unfortunately impacting business investment and government strategy.

Where European conversations were about global competitive advantage, cross-border trade and collaborations, growth and big investments, English conversations were about England and UK schemes.

I was fortunate to talk with two top experts in recycling and waste in UK, namely Ray Georgeson, CEO of small entity Resource Association and consultant, and Mervyn Jones, of consultancy Sustainable Resource. Both men were major contributors to WRAP UK at senior levels, Ray as first CEO and Mervyn as an Executive. I also met others involved in plastics, resource recovery and programs. Carbon emissions and Paris targets were always underlying the conversations.

8.1 CIRCULAR ECONOMY STRATEGY

Rather than sign up to the EU Commission's CE Strategy of 2016, the UK government chose to integrate elements of CE into its Industry Strategy released November 2017.[42] This links to the UK's Clean Growth Strategy (Oct 2017) and the government's commitment to zero avoidable waste and doubling resource productivity by 2050. While the Industry Strategy is rather vague, it does specify:

1. Maximising the value extracted from resources
2. Promoting recycling
3. Developing stronger secondary materials market in the UK.

It was interesting that during our time in UK no one referred to the Industry Strategy, indicating it was not functioning as a guiding document setting directions for industry or government. Likewise, only two people mentioned the Plastics Pact (launched in April, just before we arrived in UK) and both were directly connected with it.[43] I anticipated hearing a lot more than I did about the positives of the Plastics Pact and PRN system (the UK's EPR scheme for packaging) while in the UK.

8.1.1.1 Packaging Programs and Plastics

The UK does not have a comprehensive national EPR organisation for packaging equivalent to Fost Plus in Belgium or Nedvang in the Netherlands. It has a Packaging Waste Recovery Note system (PRN) whereby obligated entities pay a fee relevant to the packaging they bring to the market. In this respect it is like our Australian Packaging Covenant Organisation, however, the difference is that the PRN funds partially contribute to the cost of recovery, which is not the case in Australia.[44] The PRN fees can be paid to a range of approved compliance organisations, and the largest is Valpak. It is thought that the competitive nature of the UK system may contribute to the lower cost for the fee, but it is difficult to ascertain given the diversity of the scope and services provided by the various EPR schemes.

Valpak is a commercial entity and as the first entity established in 1997 it has over 50% of market share in EPR schemes in UK. There are approximately 25 others that include Biffpack, Wastepack and Veolia.

[41] https://www.oecd.org/regional/regional-policy/profile-United-Kingdom.pdf
[42] https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future
[43] http://www.wrap.org.uk/content/the-uk-plastics-pact
[44] https://npwd.environment-agency.gov.uk/Public/GenericContent.aspx?CategoryId=595F40C2-76C4-49E3-8FC8-396CCDB77A9E

As a business, Valpak has adopted a broader remit beyond packaging; it also collects fees and provides a service for ewaste and batteries.[45] Furthermore it provides consultancy services to companies on energy and carbon saving opportunities, forming CSR policies and compliance with UK environmental legislations. Valpak had established the 'Recycle-More' glass service in 2001 which it then sold to a bottling company in 2003. It has also published documents such as 'Packflow 2025' with analysis of trends and recommendations for the UK government on circular economy, packaging and ewaste programs and targets.

In terms of a focus on plastics the Plastics Pact is the UK's voluntary agreement developed between the Ellen Macarthur Foundation and WRAP UK with four targets on plastics packaging. It is the first instance in the world where 40+ companies have pledged to eliminate single use packaging (with some qualifications) by 2025, plus other measures. It has an impressive list of participating companies and some daring targets.[46] It certainly pushes forward the momentum for greater care and control in the production, use and recovery of plastics packaging. The Plastics Pact has the support of the relevant departments in England, Scotland and Wales.

Figure 26 Plastics Pact – packaging targets to 2025 (source website, July 2018)

However, the devil is often in the detail.

The first noticeable element is that unlike the EU Plastics Strategy, the Plastics Pact only deals with packaging, not all plastics products and packaging. Secondly, it lacks detail on responsibility, method, definition, funding and how it will be developed into a more detailed strategy or action plan. The website and information around the launch is minimal.

A number of people in the plastics industry were disappointed that it was 'yet another voluntary agreement'. Some connected with the programme said 'having set the targets, now we have to work out how to deliver them'.

Reading through the various announcements by companies it is not clear whether companies or supply chains will take action, contribute and report on progress, or reach targets. Nor is it clear whether the UK will engage with the EU Commission on its actions, such as cracking down on bioplastic claims and eliminating oxo-degradable plastics from the EU market.

8.1.1.2 UK landfills and Waste to Energy facilities

The absence of a current waste policy and strategy by the UK government has prompted a number of companies and industry associations to develop their own. Suez produced its *Mind the Gap 2017-2030*

[45] https://www.valpak.co.uk/home/about-us/our-history
[46] http://www.wrap.org.uk/content/the-uk-plastics-pact

which identified the challenges with lack of infrastructure to address the waste generated in the UK – whether landfill or W2E facilities, and the potential impact of Brexit and China.[47]

Unlike Germany and the Netherlands, UK still has landfills, however, the number of landfills has dropped markedly from thousands in the 1990s to around 50 by 2020 with these landfills reaching capacity. According to Suez, there is insufficient W2E infrastructure investment in the pipeline to meet the gap, and Brexit and China means the solution of exporting waste will likely become more expensive.

8.2 WRAP UK (Waste & Resources Action Programme)

Head of Government and Communities, Claire Shrewsbury

WRAP UK is both a charity and company limited by guarantee. It has been successful as a facilitator of change in key sectors in the UK with distribution of funds, research and building collaborations between companies for improved resource productivity. On the basis of its research it has formed campaigns such as 'Love Food Hate Waste'. All has been voluntary, in contrast to the European model which is based more on directives and hope of compliance. WRAP has been funded through the Courtauld Fund and other contributions, however, government funds have been cut over the last ten years with consequential cuts to programs and research.

Claire explained that the UK Government is currently undertaking a review of both the Producer Responsibility Regulations and The Waste and Resources Strategy consulting with industry on targets post-2020 to 2025. Some six workshops have been held with around 200 people which is contributing to a paper for Minister Michael Gove.

There is consideration being given to splitting the PRN targets for glass and other recyclables to lift recycling and reprocessing rates. Indeed there was a piece of research conducted 18 months ago to establish Guidelines and Agreements with reprocessors on what material specifications they want for paper, cardboard, bottle tops, etc. to provide better guidance to industry. There is thought that brands and retailers will coalesce around six core materials, such as metal packaging, and a few polymers, rather than the profusion in existence at the moment. It is not clear whether these Guidelines are consistent with the EU's certification standards for sorters/reprocessors.

In discussing the Plastics Pact, Claire revealed this had been in development for 5-6 months, with the negotiations with companies in the final six weeks. It appears as though signatories have to become members of WRAP. Claire was reasonably confident the targets could be achieved, based on years of research and facilitation work undertaken by WRAP with companies and supply chains, and data arising from the Packaging Waste Recovery Note system (PRN).

8.2.1.1 Residential recycling and waste services

In the various places where we stayed we saw bin systems similar to Australia for residential and commercial premises, with some variations.

With regard to residential kerbside collections and packaging, WRAP has done research over decades and recommended that councils adopt greater separation at source. However, there remains a mix of three systems in use in the UK:

1. Kerbside comingled recycling system (as in most of Australia)
2. Comingled bin with separate glass collections in crates
3. Three tier bin system with separate chambers for glass, paper and cardboard, metals and plastics. This level of separation would be closer to Belgium, Germany etc.

[47] https://www.theguardian.com/suez-circular-economy-zone/2017/sep/20/were-running-out-of-landfill-and-brexit-could-make-it-worse-says-new-report

I learnt later that Welsh councils have been progressively moving to the latter system given the high quality material arising from the collections.

There is also diversity in what is collected, apparently 75% of councils across the UK collect all plastics packaging in kerbside, whereas 25% do not (have some limitations on what can go in recycling bins), and there is currently no data or information back to councils on the destination of the material and the quantity of material reprocessed versus incinerated or exported.

In many respects the UK system replicates Australia, except for the fact that there is greater diversity with three different bin systems in use.

8.2.1.2 Sustainable Resource Consultancy

Director, Sustainable Global Resources, Mervyn Jones

Mervyn was an executive at WRAP until recently and has established a consultancy business working in UK and EU. He has an excellent overview approach and extensive expert knowledge of both UK (Britain, Scotland and Wales) and EU legislation and different approaches.

He explained that UK prefers to encourage rather than legislate, hence WRAP, and their research approach focused on priority materials/products, supply chains, market mechanisms and facilitation through introductions.

He recounts that in 2003 there was no plastics reprocessing in the UK, and that WRAP identified that of the 1.2M tonnes, 650K tonnes was suitable for reprocessing but needed markets and technology for processing. WRAP offered a £5M loan program working with businesses and investors to bring about the change to the system.

This led to the formation of an Industry Investment Panel to de-risk investments in waste and recycling. With the investment industry and waste and resource recovery sector behind it, it was an alternative to the capital markets with low market rate loans. This succeeded in diversifying the market for materials and products, thereby providing a stronger business model.

Recycling was supported by an escalating landfill levy of £115-165 / tonne for general waste with regulated price increases across the board.

Mervyn now works extensively in EU, having just completed a review for the Netherlands Government of their Green Deal Circular Procurement program and pilot projects (managed by Joan Prummel and Cuno van Geet). We discussed the different forms of procurement programs that include Performance-based vs Functional, and how companies are engaged and asked to meet minimum standards and get positive ratings. His review analysed the various pilots in the Green Deal program and made a number of recommendations for integration into policy.

8.2.1.3 Resource Association

Chief Executive, Ray Georgeson (Leading UK NGO expert, formerly WRAP)

Ray is pithy and direct in his statements and highly attuned to movements in politics and the ministerial circle. He described how New Labor under Blair had established targets for local authorities, however everyone was focused on collection not recycling rates, and barring a small blip with China's Green Fence in 2008-9, the focus was on export.

He is concerned that UK has left it too late to recognise that reprocessing capacity is fundamental to recycling, that hollowing out manufacturing and reprocessing means minimal recycling. He described it as a classical social vs market conundrum – how to support and provide incentive for investment?

In his view the solution is a package of measures from selective bans, mandatory recycling content and encouragement.

The Chinese ban has forced the issue, and standards are rising everywhere. He bemoaned UK approach with comingled recycling as poor quality – that it will be getting buried. Material is piling up looking for a home, going from Germany to China, to India. The problem is that there is no legal requirement for reporting on the destination, unlike in EU. He is a big advocate for legally compliant export of materials, and source separation for maximum quality in recovered material. He is scathing of comingled collections and the perpetuation of this system as a result of the pressure of waste management companies.

8.3 MANCHESTER REGION

8.3.1.1 Axion Consulting and Plastics, Manchester

Head of Engineering and Research, Sam Haig
Principal Consultant, Collection Services, Jane Gardner, and
Graduate Environmental Consultant, Sam Research Engineer, Molly

Established in 2002 as a consulting firm Axion expanded by joining with SNorton, the largest UK metal recycling firm in 2005. Axion now has 100 employees in a) polymer processing and b) consulting. [48]

The **plastics reprocessing** journey started when SNorton realised there was a growing quantity of plastic in cars, and so they invested in Axion. This was around the time of wide fluctuation in ewaste, and the owners realised diversification and control of feedstock was essential.

The company takes an engineering technology approach seeking to recovery high value material previously going to landfill – especially plastics and metals as part of the UK's commitment to the EU End of Life Vehicle Directive. Their partnership with S Norton (vehicle/metals recyclers) enables them to recover plastics such as ABS which goes back into vehicle production via a sophisticated plant on the land next to the vehicle recycling yard. They have also a plant in Liverpool for WEEE electrical material, where they process 20% of UK market, which is ~20% of EU market.

Figure 27 Via EU Directives to UK investments: from scrap cars to clean high-grade polymers for new products

At this site they follow the following steps (similar to the vehicle disassembly seen at IFAT, Munich):

[48] https://axiongroup.co.uk/

1. Depollution: remove engine, tyres, airbags, etc
2. Shredding: of metals (steel, aluminum, brass) and also plastics (ABS, Nylon, SAN, PVC, PS, PP)
3. Reprocess: wash, sort, melt and pelletise plastics (the latter three steps are done at another site in region).

By obtaining high grade quality polymers they have decoupled their business from price of oil and created a secure supply chain of quality plastics.

Axion Consulting, headed up by Jane Gardner, has 11 staff and they are doing work around plastics (Government has £20M for plastics innovation), and R&D into dealing with vehicle Li batteries as they anticipate a large supply coming through in the future.

Axion Consulting is the UK regional RecoVinyl Agent (14 in total for EU and UK), and they are second behind Germany for recovered quantity. Their largest fraction is PVC window frames which is in high demand, and a fair proportion from cable stripping.

Axion has received beneficial grants from WRAP over years for the plastics vehicle recovery plant, R&D and also £50K from WRAP toward trials to establish the RecoFloor program in 2007 with industry partners Altro and Polyfloor.

Axion has just signed a new agreement as RecoVinyl Agents, and earn a fee of €50,000 for freight and staff for coordination. They typically collect a steady supply of 500 tonnes/yr, with three streams and clearly colour coded PP bags that are filled by installers and transported on pallets:

1. Smooth vinyl offcuts – back into flooring
2. Smooth vinyl lifted flooring (end of life) – road cones, etc
3. Safety flooring.

There are now 63 drop sites across the UK. Over time a number of businesses have diversified to become 'One Stop Shop' for flooring doing more than simply selling flooring, to include sell bags, drop off bags, hire tools, etc. Altro and Polyfloor do the final sort of collected material, with complete commitment for the marketing and sales with geographic division between them North/South UK. They hold a popular annual awards ceremony that celebrates achievements: The Distributor, Recycling Champion, etc. of year. Now it has been going 10 years their challenge is resolving participation in the scheme with other flooring companies wanting to get involved.

8.3.1.2 HAHN Plastics, Manchester

Director, Howard Waghorn (also see front cover photo)

President at HAHN Plastics (North America) Ltd, Howard Waghorn, is an entrepreneur manufacturer making product with recovered PE plastics. Waghorn started by making paint trays with recovered plastic, and in 2012 entered into a partnership with Hahn Plastics from Germany. This has allowed his operations in UK to accelerate investment and production, and become part of a larger company offering a large range of products for sale into different markets, with 2,000 different profiles and extrusions with over 200,000m2 production facilities in Manchester, Germany and Canada.[49]

Previously he relied on UK MRFs for feedstock, but there was poor consistency in the material coming from council collections. Now as part of Hahn Plastics, it comes from Germany because they have higher

[49] https://www.hahnplastics.com/en/

sorting standards and better quality reliable LDPE material for manufacturers. It comes 40:60 Commercial and Industrial and MRF sources and is pelletised in Germany.

Part of his growth is attributed to the 2010 UK Flood and Water Management Act which provided for 'Sustainable Drainage Systems' which has required permeable surfaces and works to minimise flooding and erosion. This means his company supplies plastic paving systems and wall systems that have benefits over concrete and steel. In Germany and Canada there are similar requirements on ground reinforcement to stop erosion and enable water infiltration in urban and agricultural settings.

Other market avenues are retaining walls for new housing estates and M5 highway (15 miles) which was months of production.

In 2011 Hahn Plastics UK gained Construction Board Approval from the British Board of Agrément[50] for its material, as durable for 120 years. They run three extrusion lines with multiple tools, 24 hrs x 5 days producing 62 different profiles. Because production is slow, they retain 6 months of product on site to meet orders, and 6 weeks feedstock in bulk bags. They do their own compounding with a 5 tonne mixer using LDPE from Germany, some granulated HDPE from within UK, and colour everything to either brown or black.

Waghorn is a happy man seeing continual growth and investment for his business. He has solar panels on the large roof of his plant, and an electric car that he charges at work.

8.3.1.3 Public Drop-Off Facility, Manchester, Viridor

Close to Hahn Plastics is the Manchester public drop off facility. The site is at least three times larger in area than the Munich site and inverse in shape. It is alongside the old Manchester landfill, and distant from homes, public transport and requires a car for access. The public drive around the perimeter, stopping at relevant bins, open cages or skips. Drop off is free, as at Munich, and there are 3 staff on site, one roving to help/advise the public as they dispose of items. Australian sites are more like the Manchester site, than Munich. The site is entirely open to the sky and so are most of the containers. The use of cages means double handling of fridges, whitegoods, TVs, fluro tubes, and items stored on shelves to be moved off site.

Viridor, similar to SUEZ and such companies in Australia, has had the contract to run the site for nine years. The site is one that services Greater Manchester region of 8 million people, and is owned by the Council and the contract is with a cooperative of four neighbouring councils. The service is bundled within council rates (between £190-450 per household and includes emergency services). Council rates cover the cost of running the site and there are contracts with customers for separated material, such as Wilcox for the textiles that are sorted for domestic or export markets.

Viridor competitors are Suez, Veolia, BIFA, and Viridor has 168 staff at 20 sites across UK.

Figure 28 Manchester public drop off facility

[50] http://www.bbacerts.co.uk/

Items for drop off in separate containers include the following

Enclosed bins	Cages	Shipping containers	Skips
Hand held batteries Paired shoes Clothing and sheets Books and magazines Pillows and duvets go to landfill or ERF	Fridges and white goods Light globes Car batteries TVs and computers Lube oil	Furniture	Green garden waste (compactor) Paper & Cardboard (compactor) Plastic recyclables Metal products Electric appliances (radios, speakers) Timber

Signage not only directs people what to put in what bin, it sometimes says where the material goes and what it becomes, telling the story. For example the furniture container mentions the charity, and the organics skip promotes the organic compost.

Other various collections in Manchester include:

- Household hard rubbish
- General Waste
- Comingled recyclables
- Bottle bank at supermarkets.

There are other sites for commercial, industrial, building and construction materials.

9 SE Asia

For the last decade a growing proportion of Australia's recovered plastic has been sent to China and to a smaller extent to SE Asia. Similarly, a growing proportion of plastic product and packaging has come from this region to Australia. It was vital to travel to SE Asia to understand the complete supply chain, how governments and companies addressed the growth and challenges, and Australia's place in this region.

However, I encountered considerable difficulties making appointments and gaining introductions into Asia. Apart from the language barrier, it is very much a cultural norm that introductions come through a recognised leader. I was surprised that so few government representatives in Australia had liaison partners in government agencies in Asia, and few companies in Australia were willing to provide introductions to colleagues in Asia. I realised that a great deal of our attention is still orientated to UK and North America, and to some extent to EU.

For this reason I remain extremely thankful for the support provided by the Malaysia Consulate in Australia, and Bechara Wafta at All Product Recycling in Sydney. I am also very grateful for these people providing wonderful hospitality and explanations of the systems and laws in these countries.

Australia is part of Asia, and our governments, professional associations and organisations, should build much stronger relations in Asia. We have a great deal to share and learn for mutual benefit.

The two countries visited – Malaysia and Thailand – have different cultural backgrounds, language, religions, government and legal structures. In terms of waste management, plastics use, recycling and manufacturing they are also different. Both have been undergoing rapid investment and development, and are seeing plastics reprocessing shifting from China to their respective countries.

I repeatedly heard before leaving and while travelling that companies closing down in China were relocating to the neighbouring countries of Vietnam, Thailand, Malaysia, Taiwan and Indonesia. However, while I was travelling, both Vietnam and Thailand announced stricter measures to minimise import of unsorted material and product from around the world and Malaysia is now following suit.

These Asian countries do not want to be burdened with poor quality material from other countries. Time will tell where the material will end up and how we progress toward regional cooperation.

10 Malaysia

I was fascinated to hear how China's ban was affecting Malaysia, and learn more about their investment mechanism in manufacturing and reprocessing material, particularly end of life plastics. I was not there to investigate the detail of their collection schemes, drop off facilities or landfills.

Malaysia is a country on the move with determination for growth and order, and everyone we met was extremely polite, charming and generous.[51]

Through the wonderful liaison and coordination efforts of the Malaysian Consulate in Australia, I was given the opportunity to attend two excellent meetings in my two days in the country. Both were ideal for my research and understanding of Malaysia's approach to plastics recovery, manufacturing, and China's ban.

Figure 29 Malaysia's capital city, Kuala Lumpur

The team at MIDA were also generous in providing me links to further information about Malaysia's strategy for growth. Green growth has been identified as one of six game changers for Malaysia. The Green Technology Master Plan 2017-2030 (GTMP), aims to mainstream green technology into planned development in line with the Green Technology Policy, which includes Energy, Water, Building, Waste across key sectors of Transport, Manufacturing, etc.[52]

In summary on that note, Malaysia introduced some residential collection schemes in 2015, and they are voluntary for various materials, ie paper, plastic, general waste. Three companies have been appointed for three geographic regions. Waste generation per capita is very, very low, but growing. The GTMP identifies that there are some 14 sanitary landfills and 147 non-sanitary ones, and that waste generation reached 40,566 tonnes some time before 2016 indicating more rapid growth than anticipated by the government.

My impression of Malaysia was one of an organised, neat and very polite society with both formal and informal systems, and a strong police presence in certain locations. Like Singapore, we saw no evidence of litter in either Kuala Lumpur or Pasir Gudang in Southern Malaysia.

10.1 Malaysian Investment Development Authority, Kuala Lumpur

Assistant Director, Corporate Communication, Wan Suhana Wan Ahmad Fakuradzi,
Assistant Director, Corporate Strategy & Organisational Development, Hanis Ilyana,
Deputy Director, Green Technology, Shahzul Jayawirawan Mohd Yunus, and
Senior Assistant Director, Chemical & Advanced Materials, Jaibalan Harirajan

I met with this wonderful team at their head office in Kuala Lumpur. For a decade I had been fascinated by the Malaysian business development incentive system which has led to Malaysia's growth in waste recycling, biomass and related manufacturing.

[51] https://www.oecd.org/regional/regional-policy/profile-Malaysia.pdf
[52] http://kettha.gov.my/portal/document/files/Green%20Technology%20Master%20Plan%20Malaysia%202017-2030.pdf

Established in 1967, MIDA has overseas offices, rather like our Australian Trade Commission, but it also reviews applications for development, considers financial incentives, provides advisory services and facilitates joint ventures. As an independent authority, they work with companies and investors in Malaysia and overseas, and government departments in Malaysia to assist with development proposals.

MIDA has 800 employees, with technical specialists in several divisions, such as 20 in Chemicals and Advanced Materials, plus Metals and others. They have a major focus on value-added product initiatives to build Malaysia's economic capacity and employment.

MIDA receives approximately 25 applications per month for licenses and incentive financial support for chemical, plastics waste and recycling related businesses, and there has been a marked increase since China closed its borders to low-grade recyclables. All development applications are assessed and require consent of local councils, Depts of Environment, Solid Waste, MIDA and Customs.

Companies applying for incentives are considered under two streams (see below) for innovation and/or Investment Tax Allowance. Recommendations are then put forward to the National Committee on Investments which comprises representatives from departments including Trade, Finance, Tax, Environment, Customs and the Malaysian Central Bank.

Figure 30 Excerpt from MIDA Investment Guide

The MIDA team state that their first priority in assessing applications for financial incentives is that any reprocessing facility firstly utilises material collected locally rather than imported material. Unlike Europe, 'scavengers' namely local street collectors are the foundation for the collection and aggregation of material for reprocessors. Reprocessors require a permit for operation from the National Department of Solid Waste, and only once they have a permit can they apply for imports. The MIDA team state that there is not enough material arising in Malaysia to meet local demand, however there is concern at the cleanliness of the material imported.

Applicants to MIDA have to answer key questions, and depending upon the answers, and what they are proposing to do in Malaysia they can receive up to 100% offset from company tax rate of 24% for five or ten year periods. This means some companies are paying only 8% or 0% company tax rate, and the better the performance the lower the tax rate. The offset rate is determined according to the extent of performance on these criteria:

- Where is material obtained from? (local collectors)
- How much material can they supply you? (agreements in place)
- What are your existing licenses? – water, feedstock, etc.
- What manufacturing processes are proposed – shredding, washing, etc?
- What is the proposed end product?
- What are the end market for local or export products?

The MIDA team told me of the Malaysian Government's Green Procurement Policy for 20% of total budget that must be for Green purchasing such as air conditioning, energy efficient equipment, paper, etc. They also have a Green Procurement Label.

The Waste section in the Green Technology Master Plan Malaysia 2017-2030 provides information on current and future targets for a range of areas in particular emissions reductions from landfill and palm oil refineries, improved practices for collections, landfills and including structural changes and interagency coordination.

10.2 HENG HIAP = PLAS HAUS, PASIR GUDANG, JOHOR PROVINCE, MALAYSIA [53]

Managing Director, Seah Kian Hoe

International Sales Manager, Ricky Chua,
Corporate Finance Manager, Dennis Tang and
Deputy General Manager and Human Resources Manager, Tey Boon How

Heng Hiap was started by enterprising Kian Seah Hoe in 2002, and he has won several awards and accolades for his achievements.

Heng Hiap is one of the top three plastics reprocessing companies in Malaysia, processing around 3,500 tonnes per month of HDPE and PP. Located in Pasir Gudang, in the southern region of Malaysia they are a two hour drive from Singapore. Located in the petroleum refinery region, the company occupies a relatively new factory with impressive, modern offices at the front and large open production area with QC lab in the middle. Behind the building structure is a series of distillation and treatment systems for refinement of the residual waste plastic into further products.

The company receives material from across southern Malaysia via scavengers and collectors, and it is all sorted off site and delivered in bales. They have established long term relationships with collectors over 15 years, teaching them to separate appropriately and the company pays them more according to the standard of material delivered. The company started by handling lots of polymers, sorting on site incl PS and PET, but have recently decided to focus on HDPE and PP.

Heng Hiep receives material that is sorted by both polymer type and four colours to gain high value price for its finished pelletised product – white/clear, warm (red and yellow), cool (green, blue and purple), jazz (low price for unsorted material). Their process is to crush, wash, melt and filter for pellets which are then sold. With their new business model (with sorting done offsite, linear production process in the factory and minimal logistics) they have cut their labour by 40% and logistics by 60% and can focus the company on high value product manufacture for customers.

Figure 31 The hospitable team at Heng Hiap: Ricky Chua and Dennis Tang, plus their plastics colour range and product range

[53] http://www.henghiap.com/

In terms of finished product Heng Hiap has 600 different specifications for different melt flow, impact, and colour, etc. Currently 70% is exported to 30 countries including 400 tonnes per month to Australia/NZ under the German-sounding brand name of *Plashaus*. The demand for quality recycled polymer is growing.

They view China's ban as a 'blessing'. Not only is it resulting in major growth for their company, they recognise 'this is accelerating the movement from global to regional responsibility for material. This is shortening the footprint and making recycling more environmentally friendly'.

They think countries should do more to process their own material. As a smart, innovative company, they have recently also undertaken other initiatives including making 'New Coal' and 'New Oil' from the residual material from their processing. This enables them to reduce waste and generate 70% power for their own site, with 1kg plastic = 1 litre diesel. They also collect rainwater from their roof for use on site.

11 THAILAND

11.1 ALL PRODUCT RECYCLING AND GOLDEN DRAGON INDUSTRIAL PARK

All Product Recycling, Director Australia, Bechara Wafta, and
All Product Recycling, Director Asia, Dennis Leung, and
Golden Dragon Industrial Park, Director, Mr Simon Mak

This story shows how China's ban is having direct impact on material flow in countries around the world.

Bechara Wafta operates All Product Recycling in Minto, Sydney with partner Dennis Leung who is now based in Thailand. At their Sydney site they wash and granulate for Australian market, and up until China's ban in 2017 they would collect, bale and send material to their warehouse in China for sale into Chinese sorting and reprocessing businesses.[54]

Now that has changed and they have teamed up with Mr Mak, developer of the large Golden Dragon Industrial Park in Thailand. Mr Mak has purchased land previously used for growing pineapples in Chonburi, in the Eastern Economic Corridor (EEC) designated by the Thai Government for development. This is close to the biggest deep sea port, one of six ports in Thailand and toward the border with Cambodia where workers will come from.

Mr Mak like others, investigated countries to relocate, and settled on Thailand, after Vietnam announced it was restricting imports. Mr Mak views Thailand as more stable and advanced, with many multinational companies and workers located in Thailand. We discussed the fact that China had hundreds of ports and leaky borders, whereas other countries have fewer, Malaysia has 3, Vietnam only 3 as well and this means greater control and logistic challenge to import and move product.

Mr Mak had run a successful business in China before the ban and was looking to retire. However, he has closed the reprocessing business and converted his premises into a car park. He is building on his land in Thailand to capitalize upon the hiatus in processing recycled material, and fulfilling his dream.

Figure 32 Mr Mak in the display centre for his integrated development, Thailand

Mr Mak's dream and plan is that in addition to over 50 large sheds for recycling businesses, the site will operate as a 'One Stop Shop'. It will have its own water treatment, energy management, accommodation, serviced offices for the many renting businesses, human resource management services, customs facility, possibly retail and offices. By having customs facility there, Mr Mak hopes to make the site attractive to many entrepreneurs.

At the time of my visit he already had 4 sheds erected (8,000m 2 each), and more on the way. He had also commenced renting the floor area, which was filling with plant, equipment (new and relocated from China) and material arriving on trucks imported from Australia and US. Roads were yet to be leveled and sealed, drainage installed and waste collection systems installed for building offcuts.

Mr Mak frequently meets with Thai government and EPA, investors, potential tenants, and at the time of my visit, he already had 15 companies signed up for various types of operations from plastics to metals recycling. Both Dennis Leung and Mr Mak are confident they will be able to invest and grow to meet China and Asia's demand for recovered materials.

[54] https://www.aprecycling.com/

All Product Recycling are planning to establish plant to wash, separate and pelletise plastics obtained from other countries in Thailand, as well as expand their operations and reprocessing in Australia. They continue to receive deliveries from commercial and industrial premises, often offcuts from production processes, such as cutting shapes from sheets of HDPE, laminated plastics, etc. It was astounding to see the vast quantity, and often high quality material that is bundled for export and not reprocessed in the country where it was used.

Figure 33 Four x 8000m2 sheds preparing for the infrastructure and businesses to enter. Dennis Leung surrounded by material from USA

Over a long day we discussed the new requirements in Thailand, which are modelled on EU and China, that all imported material requires Chain of Command with verification of source and checks for quality.

This led to discussion about the sorting system in Australia which is very linear, secretive and closed. The view of the team in Thailand, was that power rests with major companies, particularly the collectors/sorters who have locked up the contracts, who provide no transparency on source, destination, price, quality or control.

12 EVENTS

I attended three events/conferences and this section presents short summaries of highlights.

12.1 PLASTIC RECYCLING SHOW EUROPE, AMSTERDAM 24-25 APRIL, 2018

This two day event was a brilliant start and highlight of the Churchill tour. Leaders from across Europe presented the latest developments and facts on plastics recycling in Europe. The second year for this event, it was positively buzzing with energy given the strategy by the EU Commission. It drew over 2,000 attendees, over 100 exhibitors, featured 28 speakers and five Awards. The structure was excellent for it enabled focused discussion on particular polymers and celebrated achievements.

12.1.1 Introduction (4 speakers plus official opening):

- Government of Netherlands, State Sec for Infrastructure and Water Management, **Stientie van Veldhoven.** Community and EU legislators send clear message to industry: much more must be done on design, sorting, collection, secondary market, standards for inputs and outputs. Cross sector cooperation is essential for recycled plastics to compete with virgin plastics. Changes incl. differentiated tariffs, more paid by packaging waste funds for cleanup and recycling. Increase diversion from incineration. Drawing up Raw Materials Agreements. Taking action on a larger scale with circular procurement by government and industry to join the Pledge e.g. IKEA, Unilever with PET 100% recycled content. Societal & industry transitions.
- Parley for the Oceans, Founder, **Cyrill Gutsch** – It's time to get out of virgin plastic. We cannot produce more virgin plastic. RRR is insufficient. The way forward is AIR – Avoid, Intercept, Redesign materials, products and use. Adidas will be out of virgin plastic by 2024.
- EU Parliament, MEP, Greens Party, **Davor Skriec** – Support CE package; it is right answer to our challenges. Will help address high energy dependency and price of our waste. New business models, remove toxics to enable recycling, clean up oceans.
- EU Commission, Director for Consumer, Environmental and Health Technologies, **Carlo Pettinelli** – Waste management and recycling is not as it should be. Less than 30% plastics recycled in EU, waste of money and resources and export is still practiced. Value chain must change approach. Framework includes the following:
    - Operational targets of 10m tonnes into new products in EU
    - Innovation in replacement
    - Remove substances of concern that inhibit recycling ie REACH legislation
    - Review of Waste Management legislation
    - Regulations on packaging for easier sorting
    - EU CE Stakeholder platform for ongoing dialogue
    - Ancillary regulations and standards on sustainable chemicals list and reuse.

12.1.2 PET

- Plastics Recyclers Europe, Vice-President & Chair PET, **Casper van den Dungen** - Need to increase use of deposit systems across EU, essential to get better quality material to reintegrate into product. EU talking of a plastics tax – details for industry to be determined. Priorities for PET is more deposit systems, food vs non-food separate collections to minimise contamination and new business models to support these initiatives.
- FiliGrade, CEO-CTO, **Johan Kerver** – Watermark in plastic mould identifier on whole bottle surface of 15-20 micron. Patent protected. AkzoNobel now watermarking all containers worldwide. Better than chemical tracing, also appropriate for consumers in home/workplace.

- 4PET Recycling, Commercial Director, **Jena-Loup van de Wiele** – 1st post-consumer food PET recycling to go back to food contact PET. Now €50M turnover, capacity >30,000 tonnes/a. Objective is tray to tray recycling and in the process in partnership with feasibility proven in 2014. Built new wash and plant in Duiven producing both flake and granules. Reached agreement with Afafonds – Dutch Packaging Waste Fund on guaranteed monthly volumes for initial period. Working with sorters to improve quality and bailing methods. Also struggling with many manufacturers of trays than bottles, to collaborate and get standards ie adhesives.

12.1.3 PVC

- Paprec Group, Industrial Director, **Franck Seite** – has around 300,000 tonnes installed capacity. Joining forces on legal issues concerning legacy issues and phase out. EG limits on phalates, cadmium and lead. All used for decades, phased out voluntarily by industry, however, EU limits to <0.1% in items containing recycled content by weight. How can industry achieve EU targets with these constraints?
- VinylPlus, Public Affairs Director, **Zdenek Hruska** – described development of VinylPlus with 200 companies, whole value chains and Natural Step Consultants 'Trust is good – control is better'. 5 Challenges with 30 concrete targets. Proposed time-limited derogations over 15yrs for specific applications, funded by resin producers.
- Recovinyl, MD, **Ingrid Verschueren** – NGO created by resin suppliers, converters and recyclers, 185 companies. Have 10% target on materials with 30-40 year lag time to be recovered from use. Stimulate and certify recovery of 800,000 tonnes recycled PVC by 2025. Conducting survey on recycling traceability, expanding networks, new streams.
- Kunststoff Recycling van Werven, MD, **Ton van der Giessen** – (see entry for site visit).

12.1.4 LDPE

- US Assoc of Plastics Recyclers, Technical Director, **John Standish** – collaborating with PRE standardising factors in Design Guide for Packaging. Family of test methods started with PET (dispensers, labels), now doing LDPE. Have Sustainable Packaging Coalition with How2Recycle label.
- Nedvang, Director, **Marchel van de Grift** – moving from push to pull recycling focus with plastics packaging. Achieved 180,000 tonnes recovery in 2018. Measures underway:
    - Setting new sorting specifications (PRE format) and output measurement
    - Standardising recyclates
    - Application matrix for recyclates with Unilever to reach certain standard for marketplace
    - Cover 380 municipalities, 80% have separate plastics collections, 20% separate post-MSW
    - Have 50,000 PET trays available to recycle
    - Do checks and work with 27 sorting facilities and on-sorted bales to improve quality
    - Aim for quality at all steps in the system
    - Funded by PRO for testing, audits, upgrade of plant and equipment
    - Netherlands is in a reasonable position with China's Green Sword due to high local reprocessing.

12.1.5 HDPE

- EU Commission, Ecolabel, Policy Officer, **Kristine Dorosko** – (see entry for Ecolabel)
- Werner & Mertz Group, Head of Packaging Development, **Immo Sander** – company has turned from grave to grave to Cradle to Cradle, now has label with EPEA and won EU awards. Started

by removing colour from bottles in 2014, now changed pigments, labels, adhesives, consistent closures. Target to have 50% recycled content, currently running 3 lines – natural, white and grey. Also make with PP – same again with non-compatible pigments and adhesives with no residues. Working with German Government and EU Parliament on real lifecycle of these products. Have long contracts with suppliers for <50,000 tonnes. Started recyclate bottle ranges in parallel with virgin to maintain production.

- US Assoc of Plastics Recyclers, Tech Director, John Standish – three goals and various projects:
    - Natural HDPE (milk and beverages) – FDA recycled approved grades for food applications
    - Lots HDPE packaging has PP enclosures and dark colours, contaminant and end up in waste
    - Pots and pails – Grocery Store project to reuse again, working with The Recycling Partnership
    - Now starting on bulky products, not just packaging ie laundry baskets, chairs, pipe, air ducts, etc
    - Forming Demand Champions Group – big brands of Nestle, Campbells, Coke, Procter and Gamble to lift levels of recycled content and have agreed to annual audits on use
    - Developing tests that packaging designers can use to discover the impact of their packaging on MRFs ie metals, etc.

12.1.6 Awards Ceremony

There was a good sized display area for the Award entries with product displays and good labels/posters. There was good PR in the lead up to the event with all entrants listed.

1. Recycled Plastic Consumer Lifestyle Product of the Year (7 entries)
   Winner: Grundig vacuum cleaner made from WEEE recycled plastic, Arcelik AS
2. Best Building and Construction Product (5 entries)
   Winner: Beaulex, rainwater buffers, DS Smith Plastics
3. Best Recycled Plastic Packaging Product (8 entries, minimum 50% recycled content)
   Winner: Systalen PRIMUS HDPE regranulates, Der Grune Punkt – Duales System incl. Werner Mertz
4. Best Technology Innovation in Plastics Recycling (10 entries, material or process innovation)
   Winner: BarrierPack Recyclable, PE based-laminate packaging, Mondi
5. Plastics Recycling Ambassador of the Year (5 entries)
   Winner: Willemijn Peeters, Ocean Ambassador and Founder, Searious Business.

Figure 34 Winners at the European Plastics Recycling Awards and Expo, Amsterdam April 2018

12.2 IFAT Munich, Mon 14- Wed 16 May.

IFAT is the world's largest (biennial) trade fair for water and materials waste, recycling and treatment. There were 18 giant halls (260,000m2) of company and country displays (3,300 exhibitors), outdoor display and demonstration areas, and over 90 Forums over 5 days. There were over 140,000 visitors from around the world. It is so large there are travellators between rows of halls and each hall is about the size of the Melbourne Exhibition Centre.

I attended a number of demonstrations in the outdoor areas, toured the priority halls, spoke to many exhibitors and sat in several pertinent presentations (translated from German to English). I have detailed notes from these demonstrations and forums. The highlights were.

1. Demonstration of vehicle recycling

2. Food Recycling Forum
3. EU Circular Economy Package Forum
4. Plastics CE Strategy Forum – Three speakers and key points and phrases:
    - Plastics is a vector in our throwaway society; enabled in everything from clothing to cosmetics, no limitations, no controls.
    - Global plastics pollution is mostly SE Asia where they do not have the supply chain and infrastructure. 80% marine litter is from the land.
    - Three quarters of domestic packaging waste can be recycled; have to get to 100%. By 2030 all packaging and products are reuseable, recyclable and contain recycled content. Eco-design is not solution to all problems; overwhelming issue is over-consumption. 12 Billion tonnes since 1950, 1.2B tonnes annual production cannot continue, most collected plastics is down-cycled.
    - Must restructure industry. Decarbonisation strategy is essential. Biodegradable ie PLA cup is bad experience, contaminate and ruin standard recyclables.
    - Public procurement is key avenue; paper is an accepted role model. Germany has 8% recyclate in plastics packaging already. Lift to 10% = ?? 20Mt. German public procurement is over €300 B/a and EU is €1500B/a.
    - Need minimum content requirements on resin suppliers, product manufacturers ie PP pipe, windows 25%, tenders to specify recycled polymer in pipes – make it easier for recycling and harder for virgin. Cannot be voluntary only. Policy should be right to re-orientate the economic reality for reprocessing.

5. Cable recycling
6. Street bin systems
7. Electric battery and hydrogen collection trucks.

12.3 Manchester Circular Economy Club, 17 May

This was the second gathering of the Club coordinated by the City of Manchester's Waste2Resource Innovation Network and Manchester Metropolitan University. It took place in the basement bar in a hotel in Manchester city centre, with around 25-30 attendees. It featured short pitch presentations by at least nine diverse businesses followed by Q&A and then an exercise for participants to discuss their circular economy challenges and opportunities.

It was impressive to hear so many business entrepreneurs embracing sustainability, recycling and more circular material flow/models, however, the only uniting factor was their geographic location. Businesses included large established companies such as Saica (cardboard manufacturer) and Viridor (MRF, landfill and sorting company) to Intu Trafford Shopping Centre (230 tenants with lots of waste) to Branagan Flooring Service (SME flooring retailer involved in the Recofloor vinyl recycling program) to Bambino Bike Hire (start-up company) and Food Kitchen (food rescue social enterprise).

The format of the evening could have been better to allow more time for discussion and engagement with the presenters and for themes to be developed. The final workshop session was too late in the session and people chose to leave quietly, nevertheless, the handout sheets are valuable for their structure and listing.