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FOREWORD

by Krysta Harden

Vice President of Public Policy and Chief Sustainability Officer, DuPont

Achieving more sustainable systems of food production and consumption is important to every person on this planet. It sits at the heart of our ability to forge a prosperous future for our children, feed a growing population, tackle resource scarcity and environmental degradation, and deliver long-term prosperity. The challenge is figuring out ways to accomplish these goals as the world’s resources become evermore stressed and more innovative solutions are required.

According to a January 2016 report released by The Ellen MacArthur Foundation, (in partnership with the World Economic Forum (WEF)) and supported by McKinsey & Company, plastics production has increased 20-fold over the past 50 years from 15 million tonnes in 1964 to 311 million tonnes. Despite near-universal efforts to promote recycling, only 14% of plastic packaging is currently collected. The results have had enormous environmental consequences. For example, there are an estimated 150 million tonnes of plastics in our oceans today. Under business as usual projections, this figure is expected to grow until it exceeds the aggregate weight of fish in the ocean by 2050.

Working to move any highly complex system like global food, energy, or materials production toward a more sustainable future requires that all stakeholders have a seat at the table as well as inclusive, collaborative solutions, based on sound science and supported by relentless innovation. That’s where concepts like the “circular economy” can help bring new thinking to old dilemmas. Shifting toward a circular economy enables a systemic change that emphasises maximizing both the use of renewable feedstocks and the re-use of materials through recycling. In sum, nothing is wasted and everything is used, in near perpetuity.

The transition to a circular economy will not occur overnight. It will require trial and error, early movers and innovators, and countless pilot projects to pave the way. One of those is The Virtuous Circle project. Supported by three pillars of feeding, recycling and education, this project demonstrates the circular economy in action and makes concrete recommendations for future action by policymakers and other stakeholders.

DuPont is proud to have played a lead coordinating role in this project, and is deeply grateful to the range of different partners who made it possible by contributing their time, passion and expertise.
EXECUTIVE SUMMARY

Plastics packaging is an essential component of a large proportion of the goods that we consume every day. Among other benefits, it preserves and protects edible products, enhancing food security and reducing food waste. Recent and ongoing innovations have meant that certain types of packaging can now perform these particular functions even more effectively than ever before.

However, the sustainability of plastics packaging has traditionally presented challenges in terms of its ability to contribute to a circular economy. Up until recently, some of the most effective solutions when it comes to preserving food and combatting food waste — such as multimaterial multilayer packaging — have proved to be among the more difficult to recycle.

The onus is therefore on industry, governments and civil society to work together on solutions that can harness the full potential of packaging to contribute towards sustainable development.

The Virtuous Circle initiative is one such effort. The pilot project, launched in October 2016, has used a three pillar approach that addresses the challenge of sustainability of multilayer packaging whilst simultaneously tackling broader societal issues of childhood nutrition in South Africa and sustainable development education.

The three pillars have involved:
- providing schoolchildren in South Africa with meals packed in multilayer pouches designed to provide optimum nutrition at the start of the school day while simultaneously minimising food waste (the “feeding pillar”);
- recycling the waste packaging from the multilayer pouches into school desks and other high value materials using groundbreaking new technology (the “recycling pillar”);
- and finally educating the school children about the importance of recycling and equipping local communities with the tools to make a lasting commitment to sustainable development in their everyday activities (the “education pillar”).

The pilot project — which has been coordinated by DuPont — has brought together a number of different partners from industry and civil society who have each contributed in different ways to one or more of the three pillars.

This report describes the actions undertaken under each of the three pillars. It also outlines the learnings and recommendations for future action that can be fed into the work of policy makers and other stakeholders in South Africa and beyond. This includes examples of practices that are transferable and adaptable to other countries and other sectors — in both the developed and developing world.
The aims of the Virtuous Circle project were inspired by a number of the Sustainable Development Goals (SDGs). But perhaps most significantly it is a clear example of SDG 17 (Partnerships for the Goals) in action.

The Virtuous Circle would simply not have been possible without the unrivalled expertise, active support, and incredible dedication of the various different partners involved. On behalf of project coordinator, DuPont, I would like to sincerely thank everyone who made this initiative a reality.

There was more than just one “virtuous circle” in what we all set out to achieve. Our starting point was a commitment to explore new ways of continuing to derive value from multilayer packaging after its initial use. But we wanted to do so in a true circular economy approach that looked at interaction between recycling and other societal goals. Hence the focus on childhood nutrition and education and the importance of equipping new generation of active citizens with the tools to live sustainably and inspire those around them to do likewise.

What started as an idea back in October 2015 during the Global Child Nutrition Foundation (GCNF) Forum when Julika Falconer and I first met finally became reality with the delivery of the first wave of school meals in October 2016. Since then the pouches these meals come packaged in, have been transformed into school desks, and thousands of children have been able to witness first-hand the circular economy at work. The project even evolved beyond its initial scope and produced exciting new research which could revolutionise the way we perceive and treat end of life plastics packaging waste.

Although this project has been made possible thanks to tens of amazing professionals who have generously shared their expertise and guided us on the way, as advisors, mentors, door openers, I would like to specially thank a few of them without who this project would not have become a reality on the ground:

Firstly, my three wing women Julika Falconer (FUTURELIFE® Foundation), Immaculada Urpina (Amcor) and Katy Newnham (Wastebuster). Your passion and dedication in making a difference is what has initiated this large project and your endurance and positive outlook is what made it deliver results in the field.

Secondly, Andrew Venters (Wildlands Trust), Iqbal Hirji (RWPA) and my colleague Karlheinz Hausmann (DuPont). I am grateful to you for sharing your expertise, vision and trust. You have been laying ground for what we hope will change the face of recycling and sustainable development in developing economies.

To all the many other individuals and organisations that played smaller, but no less crucial, roles in the project, we are extremely grateful.

And, last but by no means least, the final and most important word of thanks and recognition goes to the people at the very heart of the Virtuous Circle — the school children themselves, our constant source of motivation and inspiration in all aspects of the project.

SARAH PERREARD, Project leader, DuPont

ACKNOWLEDGEMENTS
Twin pouches produce SMART FOOD™ to go inside twin pouches. The pouches can protect food, reduce food waste and have lower carbon footprint and water use compared to non-packaged food.

Food pouches can reduce the carbon footprint by up to 40%, reduce the amount of water used by up to 80% and reduce the amount of energy used by up to 50% compared to boiling water and cleaning dishes.

Children gather and sort waste, which is shred into multilayer waste. The waste is then transformed into a recyclate resin using a DuPont compatibilizer.

The Virtuous Circle: From food and raw materials to school desks.

3 million school desks are missing in South Africa. The product, packaged in pouches, contains 100% of the nutrient reference values for all 13 vitamins per 100g.

Desks are delivered to schools and used in the classroom. The Virtuous Circle educates school children about recycling and nutrition.

The Virtuous Circle transports the pouches to schools. The pouches contain a product that is protected and has lower carbon footprint, water use and energy use compared to non-packaged food.

The Virtuous Circle creates a recyclate resin using a DuPont compatibilizer. The recyclate resin is a stiff and tough polymer blend.

Rural Waste and Poverty Alleviation creates a recyclate resin using a DuPont compatibilizer.

RWPA Solutions shred multilayer waste.

RWPA Solutions produces the virgin resin.

Produces a multilayer film.

Turns multilayer film into food pouches.

Produces the virgin resin.

Children enjoy a nutritious meal.
The question of how to feed a rapidly growing population is one of the major global challenges of our time. The number of people on our planet is expected to reach almost 10 billion by 2050, and the population of Africa is projected to more than double within a similar timeframe. To be able to respond to these rapidly changing demographics, the world will need around 70% more food than it does today. This food will need to be safe, nutritious and affordable, as well as sustainably produced and consumed.

Unfortunately, our starting point is not encouraging. Today, almost 800 million people in developing countries are undernourished. Of these, more than a quarter live in sub-Saharan Africa.

Although there is more than enough food produced to feed the world, it is unequally distributed and consumed. What is more, of all the food that is produced, over one third is never eaten. This is due to a range of factors that vary according to geographic location, socio-economic development and demographics. Prominent among them are a lack of efficient transport, storage and packaging systems to protect food and keep it fresh.

There is no “one-size-fits-all” solution to the twin challenges of ensuring food and nutrition security and preventing food waste. However, what seems clear is that effective responses will require governments, private sector and civil society working together to secure the sustainability of the food chain — not only from farm to fork, but also after it is consumed.
If we are to tackle food waste effectively, it is crucial we look at the root causes. However, these differ from country to country. As a result, they demand different solutions. In the developed world, for example, the majority of food waste happens in the household. Whereas in developing countries, waste occurs at different points throughout the supply chain.

Ensuring a well-functioning supply chain in the food sector is a complex endeavour that requires a number of different elements working together in a mutually reinforcing way. The main stages typically include not only production, storage, transport, processing, packaging and distribution, but also consumption and disposal.

In developing countries, there are some key factors that can make supply chains less effective and, at times, unpredictable. For a start, many people live in remote locations and due to financial or logistical reasons, they cannot easily purchase food at a grocery store. Also, in poor communities, most households don’t have access to refrigeration — which makes storing food rich in protein, such as meat, eggs and dairy near to impossible.

The total amount of food lost and wasted in South Africa is estimated to be in the order of 10 million tonnes per annum or about 30% of local agricultural production. The cost of this loss across the food value chain in South Africa was estimated at 61.5 billion rand per annum (approximately US$7.7 billion); equivalent to 2.1% of South Africa’s annual gross domestic product.

South Africa is a water scarce country. Lost or wasted food leads to the loss and waste of resources initially used to produce the food product. The calculated water loss as a result of food loss and waste (excluding fish and seafood) in South Africa is estimated at nearly 22% of the total water footprint of agricultural production in South Africa.

It is estimated that about 5% of food wastage happens at consumer (household) level and the cost of this waste is around 6 billion rand (nearly US $450 billion). However, a study of 300 households in the Tshwane area around Pretoria revealed fruit and vegetables are the most wasted food groups. The majority of people surveyed estimated that they waste more than 20% of their weekly fresh produce.

On a whole, reducing food loss and waste therefore can result in a triple win for South Africa:

- It saves money for farmers, companies and households
- It becomes an opportunity to feed more people
- It eases the pressure on water, land and the climate
As well as having serious social consequences, food waste is also an environmental concern. It represents a strain on already limited resources and unnecessarily increases the carbon footprint that results from food production.

The entire food chain is affected, from farming to overproduction and consumption. Tackling the challenge of food wastage requires a holistic and integrated approach if food poverty is to be prevented.

This is where appropriate packaging has a clear role to play. It preserves food quality and ensures safety along the supply chain, and into our homes. It prevents contamination and acts as a barrier against oxygen or moisture that can cause our food to degrade at a faster rate. And as a result, it extends shelf-life and can be used to make portion sizes suitable for our individual needs.

Constant advances in packaging and materials have made a real impact on reducing waste. In simple terms, longer shelf-life gives retailers more time to sell and consumers more time to consume. Even so, can packaging be considered environmentally friendly, if producing it has a carbon footprint?

In fact, recent studies have shown that the environmental benefits of reducing food waste surpass the environmental impact of the production of film packaging.

Appropriate packaging therefore often brings net environmental benefits because of the functions it performs. For example, the environmental gains from prevented food waste are usually much higher than the impacts of the production of the packaging itself.

However, the challenge remains of how to ensure that the packaging is not wasted at the end of its life, and does not end up polluting the land or oceans.

Identifying new ways of responding to this challenge in different socio-economic realities was one of the key goals of the Virtuous Circle project.

**THE ROLE OF PACKAGING**

**DID YOU KNOW?**

A sirloin steak that is vacuum packed can have its shelf-life extended from 6 to over 20 days. The total waste including food and packaging is reduced by 50%.

**AMCOR — A GLOBAL LEADER IN RESPONSIBLE GLOBAL PACKAGING SOLUTIONS**

Project partner Amcor’s packaging innovations demonstrate how responsible packaging contributes to reducing impacts throughout the entire supply chain. A few examples include:

- increasing the amount of recycled materials used and using raw materials that have a lower carbon footprint,
- increasing the efficiency of customer processes by designing packaging that enables faster sealing, reduces spills and breakage and allows more energy-efficient sterilization methods,
- designing packaging that maximises the optimum use of transport space or eliminating the need for refrigeration which helps to improve the efficiency of distributing goods.
**PILLAR ONE – FEEDING**

**FOOD SECURITY AND CHILD DEVELOPMENT**

The UN Sustainable Development Goals set a target of zero hunger and ending all forms of malnutrition by 2030.

Today, the prevalence of malnutrition across the world is especially alarming in children.

According to the United Nations, one in four of the world’s children suffer stunted growth. In developing countries this rises to one in three.¹³

The Sustainable Development Goals also aim to address the fact that 66 million primary school-age children across the developing world attend classes hungry, 23 million of these in Africa alone.¹⁴

School feeding programmes provide a solution to help break intergenerational cycles of hunger and poverty that affect the world’s most vulnerable areas.

Currently, only about one out of every five children in the world receives a daily meal at school, with coverage highest in developed and middle income countries.¹⁵

Families have a strong incentive to send their children to school on a consistent basis if they know they will receive a nutritious meal every day. This helps improve a child’s education and his or her broader development. It has been shown that school meals help to increase enrolment and attendance and decrease dropout rates — in particular of girls. It also serves to enhance cognitive abilities.

**THE LINK BETWEEN CHILD DEVELOPMENT AND HEALTHY NUTRITION**

Alison Fleet, Nutrition Specialist, UNICEF*

The link between nutrition and child development is well established. The first five years of a child’s life are crucial as a child will quickly progress from not being able to speak or walk to rapidly obtaining fairly advanced social, cognitive and motor skills. The extent to which a child successfully develops these skills depends to a large extent on nutrition.

If a child is malnourished then not only is early development impaired, but health is also put at serious risk. Poor nutrition will weaken their immune system making them more susceptible to disease, increasing the severity of any illness and also hindering recovery.

During the first five years of life, children grow rapidly — more than they will at any other point in their lives. At this formative stage, it is crucial that their nutritional requirements are met. This will not only prevent the short-term negative consequences of malnutrition, but will also lay the foundations for a child’s future, since early child development is recognised as one of the most important predictors of future social capital and national productivity.¹⁶ Therefore, making sure that children are well-nourished is critical not only for their health, but also for the benefit of society.

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*A Alison Fleet is currently a Technical Specialist for the Nutrition Unit with UNICEF Supply Division headquarters office in Copenhagen. Alison has also worked as a senior product development manager for Blackmores Ltd, Australia and has received a master’s degree from Sydney University. Any views expressed in this article are the author’s own and do not represent the views of her past or present employers.

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Arlene Mitchell, Executive Director, Global Child Nutrition Forum

**NUTRITIOUS SCHOOL MEAL PROGRAMMES PROVIDE A LONG-TERM INVESTMENT IN CHILDREN’S DEVELOPMENT THAT CAN BRING STRONG ECONOMIC, SOCIAL AND EDUCATIONAL RETURNS. ON TOP OF HAVING WIDE-REACHING EFFECTS ACROSS A CHILD’S LIFE, EVIDENCE SHOWS THAT FEEDING A CHILD AT SCHOOL CAN BE AN ESSENTIAL TOOL FOR THE DEVELOPMENT AND GROWTH OF COMMUNITIES AND ECONOMIES. DELIVERING EFFECTIVE EDUCATION AND SUSTAINABLE HEALTH HELPS TO ENSURE CHILDREN BECOME PRODUCTIVE WORKERS AND CITIZENS IN DEMOCRACY. WHEN DEVELOPING COUNTRIES START FEEDING CHILDREN AT SCHOOL, THEY SHAPE THE FUTURE OF THEIR OWN COUNTRIES.**

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12 Virtuous circle – food security, packaging and sustainable development 2017
The partners in the Virtuous Circle project have come together to explore innovative ways of feeding undernourished population groups using a circular economy approach.

The first pillar of the project targeted twenty-seven primary schools with learners aged 1-13 and one orphanage. Project partners supplied a supplementary meal of highly nutritious food to the children prior to starting their academic programme. The main innovative feature was its circular economy approach, through the combination of:

- “Smart food™” designed to meet the needs of children in isolated communities, and
- “smart packaging” that keeps the food fresh for as long as possible and can later be recycled.

**THE FEEDING PILLAR IN NUMBERS**

- 27 quintile 1-3 Primary & Combined Primary Schools
- 2 Provinces: KwaZulu-Natal and North West Province
- 7 Pre-Primary Schools in KwaZulu-Natal
- School learners aged 1-13
- 1 Orphanage
- 1 large scale disaster relief Malawi
- 16 580 learners
- More than 650 000 FUTURELIFE® meals delivered

_“The difference that has been made by this programme to our school is immense. We are teaching learners coming from poor families who come to school...hungry. Learners now get to eat breakfast here. We don’t have poor late comers and attendance issues anymore and enrolment seems to have improved. We hope that in the future the gesture that you have shown us will be extended to other schools. They need this type of programme to ensure their learners are able to concentrate in the classroom, because without food, they cannot concentrate.”_

_Headteacher Khumalo, Aldinville Primary School, Kwa-Zulu-Natal, South Africa_
There have been many changes in South Africa’s education system post-1994. Race and religion are no longer used as criteria for exclusion and enrolment rates have risen to more than 12 million nationally.

However, socio-economic realities are harsh. Students raised in impoverished surroundings are dogged by hunger, associated poor health and disease. On top of this, they can also suffer limited cognitive and physical growth due to the lack of proper nutrition and the long distances they have to travel to attend school.

Geography is critical to a child’s development and the school dropout rate. Rural areas are often vast and sparse, meaning many homes are far from the school. In addition, the available transport is often unsuitable or costs too much for many families to afford. Consequently, children are forced to walk distances of over 15 km to school — setting off very early, in many cases without having eaten breakfast, and negotiating precarious terrains. They frequently arrive at school exhausted and inevitably struggle to maintain concentration throughout the day.

The South African government’s National School Nutrition Programme (NSNP) started (in 1994) to provide meals to children at school, whilst also educating them about nutrition and sustainable food cultivation. The focus is on improving educational outcomes through the provision of protein-energy based nutritional food. In rural communities this is often the only meal a child will get for the day and can be an added incentive to their families for them to attend school.

The challenge remains that the NSNP only ensures that children receive 30% of their nutritional needs for the day. And after a long and arduous journey to school, this makes them ill-equipped to focus on learning without a meal at the beginning of the day.
A MEETING NUTRITIONAL NEEDS

In the communities targeted by the Virtuous Circle project, many children walk long distances to school and arrive on an empty stomach. However, even once they get there, they do not generally receive their first meal of the day until around 11 am, when NSNP meals are usually served.

In addition, most schools do not have the necessary equipment to cook or sufficient cutlery and tableware to feed their students, meaning the time taken to feed the children is doubled to accommodate two sittings. This is often the only practical solution but it results in the children spending less time in class.

The Smart food™ meal piloted in this Virtuous Circle project offers a practical and time-saving solution to this challenge. It allows children to be fed quickly as soon as they arrive at school, resulting in better concentration throughout the day. In addition, the meal gives them an energy boost thanks to its low Glycaemic Index (GI), so the children feel fuller for longer and have more energy to learn. Given that the children are fed earlier in the morning, their hot school meal can then be served later in the day. The most significant outcome is that children receive not only one meal, but two.

WHAT IS SMART FOOD™?

Nutritious instant meals are an important solution for many schools as they reduce the time spent preparing and serving meals, and leaves more scope for learning. The food lends itself to South Africans taste preferences for porridge-like textures.

FUTURELIFE® came up with a unique cooking process that allows food such as maize and soy to retain its nutritional properties over a longer period. FUTURELIFE® Smart food™ is a meal that is high in Energy, Protein and Fibre. It contains 45 key nutrients and 100% of the Nutrient Reference Values are met for all 13 vitamins per 100g. Its properties also allow for sustained energy and ensure daily hydration. It is free of wheat, gluten, lactose, as well as artificial colourants and flavours, while staying fresh without the use of preservatives.

The product is a dry solution, which is stored in multilayer flexible packaging that acts as a barrier to oxygen, moisture and light. The packaging plays an important role in ensuring the nutrients are kept intact even in circumstances where there no refrigeration available.

This meal is ideal for use in situations where the food cannot be kept fresh or where there is little time or space to prepare nutritious meals. By adding water, people can have a ready-made and nutrient rich meal without further preparation, which makes it easy to consume in any situation.
B SMART PACKAGING

Key to the societal and environmental benefits of Smart food™ itself is how it is packaged. The dual compartment pouch includes a system with two compartments separated by a frangible (or burstable) internal seal designed to ensure that the ingredients can be stored in optimum condition. Squeezing the pouch bursts the internal seal allowing the contents of the two compartments to be mixed inside the closed pouch — usually by shaking — without disturbing the outside seal. It is a clear example of how packaging can contribute to food security, product life extension and controlled product activation at the point of use.

“THANKS TO THE DUAL COMPARTMENT POUCH, SCHOOL CHILDREN ARE ABLE TO CONCENTRATE FOR LONGER, MAKE THE MOST OF THEIR EDUCATION AND HAVE ENOUGH ENERGY FOR THE LONG WALK HOME. IT’S A RECIPE FOR SUCCESS.”

JULIKA FALCONER, CEO, FUTURELIFE® FOUNDATION TRUST

WHAT ARE FRANGIBLE POUCHES?
Maurice Azagury, Packaging Business Development Manager – EMEA region, DPM (DuPont Performance Materials)

Frangible pouches require two types of seals: permanent (lock-up seals) and frangible (burstable seals). A special grade of DuPont™ Surlyn® Ionomer sealant resin is the sealant of choice for frangible pouches because a single sealant layer can provide both lock-up and frangible seals. It does this by controlling the seal bar temperatures.

Candidates for frangible pouches are product or food formulations that have a higher value benefit by separating their ingredients until the point of use or consumption. One example is powdered milk and pure water. Others included certain types of probiotics and water which must be consumed soon after hydration.

Heat Seal Strength of Various Sealants

<table>
<thead>
<tr>
<th>Mylar® LBT/Sealant</th>
<th>0</th>
<th>2000</th>
<th>4000</th>
<th>6000</th>
<th>8000</th>
<th>10000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal Bar Temperature, °C</td>
<td>100</td>
<td>120</td>
<td>150</td>
<td>175</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

Source: DuPont

Surlyn® Frangible grade
Lock up seal
Peel seal (frangible seal)
A number of key learnings emerged from the feeding phase of the project. To understand its impact on the ground, surveys of teachers from participating schools were carried out. This allowed project partners to fine tune specific elements during the course of the feeding programme, as well as providing crucial feedback on the overall value of the project.

In general, the reaction was overwhelmingly positive. Time savings and ease of storage were cited as the most significant benefits of the pouches. Almost every teacher who took part in the survey agreed that feeding the pouches reduces time needed to prepare food for the children and is easier than cooking a traditional meal. Similarly, nearly all respondents valued how easy the pouches were to store. Overall, only a small minority of the teachers would still prefer to receive food in bulk now that they have tested the pouches.

In addition to the practical benefits for the teachers, the Smart food™ itself proved popular among the school children and their families. It also had a demonstrable impact on attendance levels and children were able to make the most of their time in school.

What can be learned from this feedback? And how can these learnings be applied in other schools, other countries and other areas of activity?

Insights and recommendations from project partners based on the experience of this pilot project, include:

- **The critical need to ensure schoolchildren benefit from an early morning meal** – through nationwide government sponsored school feeding programmes or non-governmental donation based initiatives. In South Africa, this would involve the extension of the National School Nutrition Programme to cover at least 50% of daily nutritional needs.

- **The benefits of easy to store packaging solutions combining food and water** – cutting out the need for refrigeration in resource poor areas and significantly reducing the risk of food waste.

- **The potential of the dual compartment pouches for use in other settings** – during the course of the project, extra pouches were provided to an NGO helping rural communities suffering from food insecurity in Malawi to shift to more efficient forms of agricultural production. The pouches help meet a temporary need for a supplementary source of nutrition during this transition period. The unique properties of the pouches also lend themselves to broader humanitarian aid initiatives (see page 18). For example, in February 2017, 20 000 FUTURELIFE® pouches were donated to City Hope Disaster Relief to aid those affected by a cyclone in Mozambique.
We spoke to 228 teachers, from 18 schools, about their experience of the food pouches...

- **70%** of children find it easy to burst the central seal of the pouch.
- **99%** of children liked the taste.
- **96%** thought the pouches were easy to use.
- **96%** of children found the pouches easy to use.
- **90%** thought an extra meal encourages class attendance.
- **86%** thought the pouches helped concentration.
- **70%** said the pouches were easy to store.
- **96%** of children thought the pouch packaging solution was better than the bulk food.
- **95%** of teachers agreed that pouches are easier than cooking traditional meals.
- **96%** agreed that the pouches were easy to store.

Base: 228 participants spread across 18 schools in South Africa.
3. LEARNINGS AND CONCLUSIONS

TRANSFERRING LEARNINGS – THE DUAL COMPARTMENT POUCH AND HUMANITARIAN AID

Gregg Lacon-Allin, EqualTrade4

At EqualTrade4 we package meals that can efficiently feed people while producing minimal waste. We specialise in providing food for miners and industrial workers, but our products could also be used effectively in hospitals, in prisons or by the military.

We knew that the Smart food™ Dual Compartment Pouch would be an excellent solution to the main challenge that we face: packaging food efficiently so that it can reach a large number of people in need. The Smart food™ powder that we use makes our role as packers easier. It contains all of the most important nutrients in a dry, long-lasting form. Because it is a powder the Smart food™ can also be packaged in a space-efficient way. This means that a larger amount of the product can be transported without any corresponding increase in transport capacity. As a result, more product can be shipped to people in a single delivery with the only requirement for them to add water to the pack.

One problem that packers, and people working in humanitarian aid, often face is making sure that end-users have access to clean water. If the people who consumed our products could only mix the Smart food™ with unclean water then the entire idea behind the project would be undermined.

Before coming across the Dual Compartment Pouch, we were looking for a packaging solution in which the water could be integrated and mixed before consumption. The Dual Compartment Pouch technology solved this problem. The water is sterile ensuring optimum product safety. The controlled activation allows the water to be mixed with the powder immediately before consumption, keeping all nutrients intact. The mix can be consumed directly from the pouch, either from a spout or from the torn corner. People can burst the pouch, mix the product and drink it from the pouch in no time at all, making the meal nutritious, easy to use and convenient.

We envisage that the Dual Compartment Pouch technology can be more effective than any other solution used before and is likely to find new applications for humanitarian aid purposes in which convenient efficient hydration and nutrition solutions are essential.

Endnotes:

2. Dupont Global Food Security Index (2016), Welcome address, Prabdeep Bajwa p.4
3. UN World Forum Programme https://www.wfp.org/hunger/stats
11. How Packaging Contributes to Food Waste Prevention, Summary of a study by Denkstatt GmbH in cooperation with ARA AG (Austrian packaging recycling association) and further partners from the sectors retail, packaging production and science (Denkstatt 2014)
12. Ibid
13. Ibid
16. (Doyle et al., 2009)
PILLAR TWO – RECYCLING

Lead partner: Wildlands, RWPA
Support (R&D) partners:
NGR
Thought leadership partners:
Amcor, Woolworths

Coordinating partner: DuPont

Lead partner: Wastebuster
Support partners:
Moonlightings Production, NECT

FEEDING

EDUCATING
Plastics packaging is an essential component of a large proportion of the goods that we consume every day. Among other benefits, it preserves and protects edible products – preventing waste and reducing net carbon emissions involved in food production. Recent and ongoing innovations have meant that certain types of plastics packaging can now perform these particular functions even more effectively than ever before.

However, the packaging itself has traditionally presented challenges in terms of its ability to contribute to a circular economy.

Of the 78 million tonnes of plastics packaging produced globally on an annual basis, only 14% is collected for recycling. While a further 14% is incinerated or recovered to create energy, the rest is either landfilled or not disposed of properly. This can contribute to environmental degradation in natural habitats both on land and in the oceans.

In particular, some of the most effective packaging when it comes to preventing food waste has proved to be among the more challenging to deal with at end of life. A prime example is so-called “multimaterial multilayer” packaging, which up until recently was broadly considered to be “unrecyclable.”

The onus is therefore on industry, governments and civil society to work together on developing best practice solutions that can harness the full potential of plastics packaging to contribute towards sustainable development.

**WHAT IS THE MARINE LITTER PROBLEM?**

Sustainable Development Goal 14 aims to conserve and sustainably use the oceans, seas and marine resources.

- **By 2025, 8 million metric tonnes** of plastic will leak into the ocean each year.
- **At least 80%** of ocean plastic comes from land-based sources.
- **Plastic packaging represents 62%** of the items collected in international coastal clean-ups.
- **In the absence of meaningful interventions, the world’s ocean will contain roughly one metric tonnes for every three metric tonnes** of fish by 2025.
There is no such thing as inherently good or bad food packaging – rather, what is the most appropriate type of protection for a given food in a particular setting.

For example, cereal or savoury products degrade if exposed to moisture. Meat, fish or anything high in fat goes off quickly if it comes into contact with oxygen. Meanwhile, other everyday items, like milk, react negatively to light. In general, most food is sensitive to a combination of these elements.

The barrier provided by packaging protects food from external threats, and plastic packaging provides this protection more efficiently than any other packaging materials.

Although we tend to refer to “plastic packaging”, in reality we are talking about a number of different types of plastic – each of which has unique properties and different strengths. Some provide a strong barrier to oxygen, while others are more effective at preventing contact with moisture or light.

As a result, flexible food packaging will often require a combination of several layers of different plastics – and, in some cases, other materials – to provide optimum protection. So-called “barrier films” are typically composed of 3-9 layers of plastics. For enhanced performance, this can increase to 13 or more different layers – none larger than a fraction of a human hair. Each layer has a different purpose, whether it is to protect from moisture, act as barrier to air, or increase strength, puncture resistance and rigidity. Certain layers are designed to make the other layers stick together, and the final layer is intended to seal the pack to make it air tight and prevent any leakage.

While the benefits of this type of “multimaterial multilayer” packaging are clear, the challenge is what happens to it when we have finished using it. Up until recently, it has not proved possible to separate the different plastic layers to recycle them in a practical way.

When recycling a “monomaterial”, the initial material properties are essentially maintained. So, for example, a PET water bottle can be recycled to create the same product. With multimaterial packaging, it is a very different challenge. Each layer has multiple properties and the components melt at different temperatures. And, just like oil and water, the various plastics do not mix together.

Innovative additives, known as compatibilisers, are therefore needed during recycling to perform this task so that meaningful properties can be obtained.

If it is not possible to recreate the initial product properties, the question is whether multimaterials can be recycled in other ways to create different products of sufficient quality to bring value to society?
1. THE CONTEXT

A DOING MORE WITH LESS PACKAGING

Efforts to boost the sustainability of plastics packaging and other packaging materials are at different stages in different parts of the world – but many of the challenges are similar.

In the case of food packaging, the overarching aim is to improve performance while using less materials. In other words, getting more protection from less volume, while reducing both food waste and packaging waste.

For many years, industry has been working to reduce the amount of plastics packaging needed to protect food. Compromising on shelf life, product safety or product integrity is clearly not an option for health, environmental or economic reasons. Therefore, different approaches are being actively pursued. These include reducing thickness and lowering weight while maintaining the same level of protection and functional performance, or even improving it.

Recent innovations in meat packaging highlight this trend. For example, “barrier shrink bags” — typically round shaped vacuum packages without air — can use up as little as 10% of standard packaging material for the same amount of meat, while extending shelf life threefold. This not only dramatically reduces packaging waste, but results in better tasting meat over a longer period, helping prevent food waste at the same time.7

CASE STUDY: LESS PLASTIC = MORE PROTECTION = LESS WASTE

Kuhne Anlagenbau GmbH, a machine manufacturer in Germany, has developed a novel technology, called Triple Bubble®. The technology produces strong, stiff films used in sausage casings, vacuum packaging for meat, lidding films and coextruded films to replace laminates. Using DuPont™ Surlyn® ionomer as a sealant for vacuum meat packages leads to enhanced performance while only consuming 10-50% of the material used in conventional meat packaging. In turn, the longer shelf-life leads to a reduction of meat waste in retail stores from 38% to 14%.8 This is a clear example of “less is more”.

FLEXIBLE PACKAGING HAS BEEN SO SUCCESSFUL BECAUSE OF ITS MATERIAL EFFICIENCY AND ABILITY TO REDUCE FOOD WASTE. BY WORKING COLLABORATIVELY TOWARDS RECYCLING AND RECOVERY OPTIONS FOR FLEXIBLE PACKAGING, WE CAN FURTHER IMPROVE THE ENVIRONMENTAL CREDENTIALS OF THIS PACKAGING TYPE, AND FIND VALUABLE NEW USES FOR THE PACKAGING ONCE IT HAS SERVED ITS INITIAL PURPOSE.

GERALD REBITZER, SUSTAINABILITY DIRECTOR FOR AMCOR FLEXIBLES EMEA & AMERICAS

ECO-DESIGN FOR PACKAGING — RETAILER’S PERSPECTIVE

Tom McLaughlin, Responsible Sourcing, Woolworths Foods

While increased shelf-life is crucial for brandholders, so is what happens to packaging when it becomes waste. This is the reason why project supporter Woolworths South Africa takes a holistic three step approach to its packaging operations. Its strategy is to:

1. Reduce – Cut the size of the packaging, and the thickness of the materials used.
2. Recycle – Support the use of recyclable materials over ones that are not, encourage recycled materials to be incorporated into new packaging and work with Producer Responsibility Organisations to achieve zero packaging waste to landfill by 2030.
3. Renew – Support the use of renewable materials over ones that are not and support the sustainable production of renewable, plant-based packaging materials.9
Even if the volume of packaging needed to protect and preserve food is being constantly reduced through innovation, we still need to find the most sustainable way of disposing of the packaging that remains. Historically speaking, the packaging industry has not focused as much on end-of-life. However, this mindset is changing and there are now many positive initiatives underway to reduce the impact and improve the recyclability of plastic material.

Multimaterial multilayer films are a fascinating case in point. On the one hand, they have proved to be among the most effective forms of packaging when it comes to volume reduction, shelf life extension and food waste prevention. But the flip side of the coin is that, up until recently, they have also proven to be the most technically challenging to recycle.

The reality is that multimaterial multilayer packaging will continue to remain necessary for its food life extension properties. However, solutions have to be found to ensure that it is not sent to landfill. There is an immediate need to find solutions to current problems of how this type of waste is managed, while continuing to invest in innovation to improve its recyclability.

When evaluating the environmental impact of an edible product, we cannot look at the packaging or the food in isolation. As with most other aspects of sustainability, we need to look at the whole picture to understand whether there is net benefit in any given approach.

The key question is whether “strictly circular” recycling (i.e. recreating the same product) should be the ultimate goal, or if a more holistic approach to circular economy thinking is needed.

To use the example of meat packaging once more, monomaterial solutions exist that could be fully recyclable. However, they may be considerably less effective in preserving shelf life and preventing food waste than multilayer packaging. As a result, its resource efficiency and net environmental benefit is much lower.

But what can be done with the packaging once it has served its main purpose? One option is to incinerate this waste to create energy. The more ambitious challenge is to identify how recycled waste from multilayer packaging can be recycled for use in longer life cycle non-food applications like lumber, construction, infrastructure and transportation.
PACKAGING CONTRIBUTES TO RESOURCE EFFICIENCY IN ALL PHASES OF ITS LIFE CYCLE BY OPTIMISING RESOURCE USE, HELPING TO PREVENT PRODUCT AND FOOD WASTE, EXTENDING A PRODUCT’S SHELF-LIFE, PROTECTING PRODUCTS ALONG DIFFERENT VALUE CHAINS, PROVIDING CONSUMERS WITH VARIED USES, CHOICES AND BENEFITS OF THE PRODUCTS IT CONTAINS AND FINALLY TO RECOVER THE USED PACKAGING AT THE ‘END OF LIFE’ PHASE INTENDED FOR A NEXT ECONOMIC CYCLE. BY ANSWERING THESE CHALLENGES, PACKAGING IS NOT ONLY VITAL TO OUR MODERN SOCIETIES AND LIFE STYLES, BUT FORMS A CRUCIAL PART OF OUR CIRCULAR FUTURE.

VIRGINIA JANSSENS, MANAGING DIRECTOR, EUROPEN

CASE STUDY: POST — INDUSTRIAL WASTE IN THE CIRCULAR ECONOMY
Peter Laybourn, Founder and Chief Executive, International Synergies Ltd.

While the Virtuous Circle project has focused on identifying the most efficient and sustainable uses for post-consumer packaging waste, the same principles apply to the recycling of post-industrial waste.

The concept of industrial symbiosis involves diverse organisations in cross-sector opportunities to make productive use of all resources (materials, capacity, expertise, logistics etc.) through profitable transactions.

A wooden table manufacturer, thinking like a system, for example, would find another industry to use the waste wood chips from their process, rather than send them to landfill. Post-industrial waste (including plastics) can be addressed through ‘traditional’ industrial symbiosis, rehoming wastes as a feedstock for others or to be reprocessed and re-used in the production cycle.

Once one starts thinking differently about waste as a resource, many things become possible. Industrial symbiosis is creating a demand-pull on innovation for novel sourcing of inputs and moving by-products up the value chain.

In South Africa, the Western Cape Industrial Symbiosis Programme (operated by GreenCape) has won international awards, and is being replicated in Gauteng and KwaZulu Natal. Increasingly industrial symbiosis is seen as a practical tool to help deliver the Sustainable Development Goals and meet Intended Nationally Determined Contributions (INDCs) agreed under COP 21 Climate Change Agreements.
The broader challenge is how to make recycling more economically viable. Collection and recycling is by nature more complex and more expensive than developing products from virgin material. In Europe, the policy of extended producer responsibility has been a driving force behind more effective waste management as it makes manufacturers foot the bill for the take-back and final disposal of the goods they produce. However, other forms of financial incentives, subsidies or tax breaks, for recyclate production are still needed to promote the development and consumption of high quality recyclate products.

South Africa

The collection and recycling of packaging materials is also increasingly becoming established practice in South Africa. Specific industry associations are jointly driving the recycling of plastics and liaising with the government in meeting targets.

However, in general, while diversion of plastic waste from landfill is increasing, multilayer plastics packaging is still not recycled. Challenges include:

1. Collection of comingled film (e.g. multilayer, metallised Bi-Oriented Polypropylene (BOPP), heavily printed low-density polyethylene (LDPE)/high-density polyethylene (HDPE) and comingled punnets/containers: Polyethylene terephthalate (PET), Polyvinyl chloride (PVC), Polypropylene (PP).
2. Availability of suitable sorting and recycling technology.
3. Identification of a sustainable and viable volume end use.

Recent amendments to the Waste Act in South Africa in 2016 are designed to encourage industries and brand owners to find circular economy solutions for this type of packaging.

Policy initiatives to promote and incentivise the recycling of plastics packaging vary considerably in different parts of the world.

Europe

In Europe, the promotion of the Circular Economy is at the forefront of the EU policy agenda. A new legislative framework is expected to be adopted in 2017/2018 which will impact a wide range of sectors and materials, including the packaging and packaging waste sector. The proposals include measures covering the whole packaging cycle: from production and consumption to waste management and the market for secondary raw materials.

PACKAGING IN SOUTH AFRICA, 2015

800,000 TONNES OF PLASTICS PACKAGING

was consumed

45% of plastics packaging was collected for recycling and/or diverted from landfill

This was an improvement of over 10% since 2012

The rate of collection for plastics packaging is higher than glass (41%), but lower than metal (70%) and paper (67%).
On top of the difficulties in sorting and separating multimaterial multilayer packaging, the general assumption is that even if it can be technically recycled, the resulting raw material is of such poor quality that it effectively amounts to “downcycling”.

The Virtuous Circle project deliberately focused its efforts on this type of waste to challenge some of these assumptions.

The packaging used to protect the FUTURELIFE® Smart food™ pouches to feed South African school children is multimaterial multilayer packaging typically consisting of 20% polyethylene terephthalate (PET) and 70-80% polyethylene (PE) based plastics. Before the project, Rural Waste Poverty Alleviation Solutions (RWPA) had already discovered how to combine multimaterial multilayer packaging with other recycled polyolefins to produce a new recyclate raw material. The challenge, however, is that these recycled polyolefins are an expensive material.

Finding other solutions required innovating thinking, collaboration among stakeholders from different sectors and segments of society, along with cutting edge technological innovation.

The crucial discovery was the role of compatibilisers. These innovative additives allowed for the different materials in the pouches to be blended into a durable recyclate raw material without the use of other recycled polyolefins. As a result, the project has led to a process that produces a 100% multimaterial multilayer recyclate raw material that can be re-used to develop products of genuine value to society.

Key to the unique circular element of the project were the products that came out of the process.

Innovation plays a significant role in producing ever more resource efficient packaging to protect and save food, and as such reduce overall environmental impact. At the same time, it is important to continue to innovate to allow further eco-efficient recycling of packaging.

Adrian Whyle, Resource Efficiency Senior Manager, Plastics Europe

Compatibilisers are substances that facilitate the interaction of different materials in a process. A simple analogy is adding detergent when doing laundry, so that the dirt dissolves in the water rather than sticking to the clothes.

When it comes to recycling multilayer waste, the different components of the film have separate functions and do not necessarily mix easily. Therefore, mixing them will lead to a product with very poor properties and, as a result, limited functionality for recycled use.

In order to enable and enhance the mixing of different layers, compatibilisers are added. These usually consist of two parts. One part mingles with the nonreactive or passive components of a blend. The other part binds onto the reactive or active components of a blend to facilitate the mixing of these non-compatibile components.

The end result is a more homogeneous polymer blend that can be processed on conventional polymer processing equipment such as film or sheet extrusion. This polymer blend can have characteristics such as strength under pressure, elongation, flexibility, toughness and stiffness that can be equal to or superior to the performance of the individual components it is made up of.
At the heart of the Virtuous Circle are the schools that have taken part in the project. Once the children enjoyed their Smart food™ meals, they helped collect the pouches and other difficult to recycle multilayer waste material that they had found. The packaging was crushed before being converted into a usable raw material by adding compatibilisers. This recyclate resin was then used to develop new durable, long-life school desks. The result has been a circular economy solution from “classroom to classroom”.

By creating a recyclate product with a direct impact on their everyday lives, children and teachers have had the chance to experience first-hand the importance of sustainable waste management and the potential of the circular economy.

The product also meets a genuine need. According to the Tutu Foundation, the estimated shortfall in school desks is at least 3 million in South Africa and 90 million across the whole of Africa.12

The logistics of the entire process involved the seamless collaboration between project partners Wildlands and RWPA.

The Smart food™ sachets were collected and baled by Wildlands and delivered to RWPA.

With RWPA’s proprietary technologic solution to recycle mixed multilayer packaging film and additives, it was possible to create a recyclate, extrudable resin out of multilayer and other collected plastic packaging waste, which essentially consisted of multilayers.

RWPA then employed a bespoke recycling solution that uses no water in the recycling process.

This recycled plastic was moulded into planks that look very similar to wood, which were then assembled into school desks by Wildlands.
In South Africa, Wildlands, a non-profit environmental charity, engages members of poor communities to collect packaging and other recyclable waste from streets and villages. These people are known as “Wastepreneurs”. In addition to Wastepreneurs, Wildlands also has an extensive schools recycling network that encourages schoolchildren to collect recyclable material.

Wildlands operates several ‘recycling sites’ where waste, bought from wastepreneurs and schools, is managed and sorted by hand. At these waste management sites, workers separate glass from paper, metal from polyethylene terephthalate (PET) from high-density polyethylene (HDPE). Each material has a market value. Wildlands resells high value materials to specialised recyclers, and they are then properly recycled and reused.

Over time Wildlands also started to accrue significant amounts of unrecyclable plastic material. These included flexible films, used for a wide range of detergent and food products. This led to the start of a partnership with RWPA to find ways of recycling this material.

RWPA was able to combine the mixed plastic material into an extruded plank, which can be used in a number of different commercial applications, including low cost housing solutions (see page 29). Another application which involves a similar technological process is the “green desk” model, which is the intellectual property of Wildlands. The difference from an economic perspective is that funding production requires industry (brand owners, converters, raw material suppliers, retailers) sponsoring a given number of desks.

A levy fee paid out of the Corporate Social Investment budgets from the companies supporting the Wildlands Green Desk project is used to pay for the wastepreneurs, the recycling process, in addition to the workers building the desks and delivering them to schools. By engaging with a range of different Wildlands school projects, such as the FUTURELIFE® Project, schools have been able to see the benefits of their waste management efforts.

Job creation is a central piece of this model, as well as indirectly alleviating poverty. If the shortfall of 3 million desks in South Africa were addressed using this model, it would enable the recycling of over 72 thousand tons of waste plastic currently going to landfill. In the process, it would create livelihood support for hundreds of wastepreneurs and small and medium-sized enterprises (SMEs).

However, while the social investment by corporate partners is a highly welcomed, diversified sources of financial support will be needed to scale up the initiative from current levels.
One of the core aims of the Virtuous Circle project has been to test other innovative methods of creating new products of genuine value from the recycled multilayer packaging waste.

In addition to school desks, other markets have been identified which could be of benefit to the communities involved in the school desk program.

By mixing sawdust, a waste product from the wood industry, with the raw material converted from the packaging waste, Virtuous Circle partners DuPont and RWPA have demonstrated through groundbreaking research that it is possible to manufacture building planks for the construction of low cost housing.

The use of compatibilisers in this process is crucial to overcoming the difficulties of combining different components to create a high quality recyclate resin.

The findings from research revealed that with compatibilisers it is possible to develop an end product for the housing market based on consumer multilayer waste and saw dust waste that comfortably conforms with minimum strength standards under the South African building codes SAN 1069 and SAN 1063 for small houses. (See infographic overleaf).

The upcycled product transforms the multilayer waste into a valuable raw material and provides a cost effective option for building applications instead of it being used for energetic recycling or simply sent to landfill.

In addition, housing planks made from recycled multilayer waste can be recycled into the same product several times without losing its properties, leading to true circularity.

WORKING WITH DUPONT, RWPA HAS BEEN ABLE TO RECYCLE DIFFERENT TYPES OF MULTILAYER FILMS TOGETHER AND OBTAIN IMPROVED PROPERTIES WITHOUT USING VIRGIN RESIN. WHAT MAKES OUR PROCESS SPECIAL IS THAT WE HAVE DEVELOPED A UNIQUE TECHNOLOGY THAT OVERCOMES THE TIME-CONSUMING SEPARATING OF THE MULTILAYER WASTE BY COMPONENT. IN THE PAST, THIS REPRESENTED A SIGNIFICANT BARRIER TO COST-EFFECTIVE AND EFFICIENT RECYCLING. BY RECYCLING ALL MULTILAYERS TOGETHER, WE ARE CHANGING THE FACE OF RECYCLING IN THIS AREA AND APPLYING THIS TECHNOLOGY TO A MUCH NEEDED DIGNIFIED GREEN AND LOW COST HOUSING SOLUTION, WITH THE POSSIBILITY OF MOVING MILLIONS OF PEOPLE OUT OF INFORMAL SETTLEMENTS IN WHICH THEY CURRENTLY RESIDE.

KARAM HIRJI, MANAGING DIRECTOR OF RWPA

* The debate is still open about the definition of “Upcycling”. In the project partners’ perspective, Upcycling is about demonstrating a step change between the residual value of the packaging waste (if any) and the commercial application it can be converted in. In this very specific case we start from multilayer waste which today has no value whatsoever, apart from the energetic value, and through collection and recycling compatibilisers it is converted into valuable building materials. These building materials can be recycled several times whilst maintaining their properties, and can therefore be re-used for the same housing application.

Prototype house built in South Africa using recycled plastics waste
Availability of affordable and green low cost housing is a major problem in all of Africa. South Africa’s landscape is mostly made up of townships and informal settlements. Here, the housing is small, crowded and vulnerable to fires, floods and sanitation problems.

The houses built with comingled film waste bring significant improvement in both comfort and safety for many developing countries’ inhabitants. What is more, these houses can last more than 10 years if properly maintained. Not only can they be rented like normal houses, making it economically sustainable, but at end-of-life the planks can be reground and remoulded into new planks.

This adds to the environmental sustainability of the model and provides a circular economy solution. It will help solve a problem of finding a home for multilayer comingled film waste as well as alleviating the lack of low-cost housing available in Africa.
The goal of the recycling pillar of the pilot project was to test the feasibility of recycling multimaterial multilayer film into new products of value to society.

The work of Wildlands and RWPA clearly shows that this is not only technically possible, but can also bring significant benefits to local communities provided certain conditions are met.

Based on the learnings from the Virtuous Circle project, the partners involved believe that there is scope for progress in the following areas:

1. **DESIGN:**

   While the use of innovative compatibilisers makes it feasible to recycle multilayer films, there are a number of ways that producers can design the initial packaging to facilitate the process e.g:
   - avoiding binding aluminium to the film
   - avoiding combining paper with plastic
   - avoiding using carbon black inks
   - replacing solution-based adhesives with coextrudable thermoplastic tie layer materials, which can play the role of a compatibiliser at the same time

   Other approaches include:
   - further developing the emerging practice of designing the packaging with “in-built” compatibilisers
   - using different types of similar polymers (Polyolefin or Polyesters) in the same structure
3. LEARNINGS AND RECOMMENDATIONS

2. COLLECTION:

Unless appropriate collection schemes are put in place, whether material is recyclable or not is a moot point. The South African waste management policy provides ample scope to continue to develop the collection of different waste streams and to serve as a model for other countries in this regard. Recyclate materials can then be used for low cost housing solutions in developing countries.

3. FINANCING:

A major challenge is how to finance these collections schemes without placing an unmanageable burden on local authorities or relying on support from corporate social investment budgets. One of the answers would appear to lie in Extended Producer Responsibility (EPR) models. However, what is crucial is that there is transparency on how EPR fees are distributed to ensure that they are targeted at closing the current pricing gap between recyclates and virgin resins.

In addition to EPR, other financing solutions could include additional tax breaks for recyclate products, subsidies for recycling processes, as well as creative funding initiatives (see recommendations in education section).

4. SOCIETAL BUY-IN:

A less tangible, but equally as crucial, success factor is ensuring awareness, acceptance and support of local communities for recycling initiatives. The more people can clearly see the benefits that sustainable actions can bring to their lives, the more likely they are to change their own habits and encourage those around them to do likewise.

It is no coincidence that the main output of the “Virtuous Circle” was school desks – as they have a particular resonance for the schoolchildren involved in the project. However, other applications of clear relevance and value to people’s everyday lives were also tested, as shown in the construction of low cost housing using recycled planks.

The key to building awareness is education – the third focus and final pillar of the Virtuous Circle project (see next chapter).

Endnotes:

2 UN Sustainable Development Goals; http://www.un.org/sustainabledevelopment/oceans/
3 (Jambeck et al., 2015).
7 DuPont Analysis of packaging material weight
8 study by Denkstatt 2014
PILLAR THREE – EDUCATING
The final pillar of the project focused on the promotion of education for sustainable development in support of the UN Sustainable Development Goals of Zero Hunger and Responsible Consumption and Production.

South Africa’s growing population means there is an ever-presging need to address waste creation and recycling at family, household, school and community level. For social, environmental and economic reasons impoverished households need to understand how they can maximise resources and manage their surrounding environment.

Schools are a crucial platform for promoting understanding of these issues among young people, and for this knowledge to transfer back to their homes and communities.

The South African Department of Environmental Affairs Strategic Plan for 2010 – 2015 set education and awareness as one of its major environmental objectives. It aimed to achieve this through cooperation with the Department of Education, South African Qualifications Authority (SAQA) and Sector Education & Training Authorities (SETAs) in supporting continuous review of environmental curriculum linked to sector demands. This included training for teachers and facilitating Environmental Awareness workshops. However, targets were limited to between 30 and 70 teachers per year and only 1-5 workshops in each province annually.

This example is symptomatic of the scale of the challenge in South Africa. While there are a number of positive government, private sector and civil society led initiatives aimed at raising environmental awareness, they tend to be disparate, and focused on metropolitan areas. Unfortunately, there is currently little or no synergy between these initiatives and in most cases, interventions are not scalable. In addition, a significant proportion of schools are located in hard-to-reach areas with limited access to ICT technology or internet. Therefore, the vast majority of school children are unable to benefit from such programmes or from online educational resources.

Despite these challenges, there is strong potential to build upon existing initiatives through collaboration, raising awareness of available projects and sharing best practice. Fundamentally, there is a significant opportunity in South Africa for educational initiatives to make a positive impact on the environment and to have socio-economic benefits.
Given the complex sustainability challenges faced today, it is of utmost importance to consider how the younger generation is responding. Simply being aware of the nature and seriousness of these issues is insufficient for resolving or even improving them. In fact, it is equally important to develop young people’s capacity to meaningfully and adequately address sustainability concerns.

As such, education is a key factor in developing young people’s understanding and competencies. To effectively tackle sustainability issues, we must bring about a change of consciousness in individuals and their practices/habits, which can only be achieved by learning. With the right education, young people will be well equipped to respond effectively to these issues and take appropriate action. However, most of the time spent in formal education is used to develop basic skills and literacies. Only a fraction, at best, of these hours is spent on developing the capacity to respond to the challenges of our time and to improve the well-being of the planet and its people.

Consequently, new forms of teaching, learning and civic engagement are essential, particularly given the complexity of the issues faced. Learning, therefore, should focus on Education for Sustainable Development (ESD). In this context, all educational institutions should consider it their responsibility to deal with matters of sustainable development and to foster the development of key competencies.

ESD aims at enabling young people to not only acquire and generate knowledge, but also to reflect on and anticipate possible future effects. Young people need to understand the complexity of behaviour and the shared responsibility of making decisions at global and local level. After all, education is expected to make young people more aware and better qualified to take part in shaping future developments responsibly.
Examples of current programmes in South Africa

GOVERNMENT PROGRAMMES

Eco-Schools Programme — The Eco-Schools Programme is designed to encourage curriculum-based action for a healthy environment. It is an internationally recognised award scheme that accredits schools that make a commitment to continuously improving their environment. The programme is one of the most extensive school-based Education for Sustainable Development (ESD) networks in South Africa with over 1,200 registered schools.

National Teacher Development Network — All of South Africa’s major ESD organisations have conceptualised a sector-wide response to develop a national high-quality, high-impact Teacher Professional Development Programme that will support teachers in acquiring the environmental knowledge, skills, values and competences needed to teach the environmental component of the South African national curriculum.

Western Cape Government — In Western Cape, the Department of Environmental Affairs and Developmental Planning collaborates with the Western Cape Education Department to implement a Waste Management (WAME) project. This project aims to integrate environmental education into the school curriculum by training educators and encouraging them to increase the environmental awareness of learners.

INDUSTRY PROGRAMMES

Woolworths Education Programmes — For more than a decade, Woolworths has created valuable educational resources and provided learning opportunities to thousands of schools through Woolworths Educational Programmes. The programmes engage with principals, teachers, primary and high school children as well as parents. Currently, more than 2500 primary schools in KwaZulu-Natal, Gauteng, Western Cape and Eastern Cape take part.

Mplant school and community recycling schemes — Mplant schemes provide the infrastructure for recycling such as recycling bins, but only to a limited number of schools. They do not provide any curriculum aligned education on the importance of “reduce, re-use, recycle” — and, as such, their services assume prior knowledge.

POLYCO PACK-KA-CHING™ project — The PACK-KA-CHING™ project, a POLYCO programme which will be launched in 2017, is a prime example of the packaging industry’s commitment to educating the public on recycling. A key objective of this project is to introduce the youth to recycling so that they can grow up with this practice as second nature. PACK-KA-CHING™ will use primary and high schools within each community as a key platform to market the project to parents and adults.

NON-PROFIT PROGRAMMES

WESSA ShareNet — The WESSA (Wildlife and Environment Society of South Africa) ShareNet is an innovative South Africa-based, informal networking project that supports ESD through an open copyright-free ESD learning resources network. Materials include information and ideas for environmental action, concise envirofacts and teaching guides that provide teachers with a range of learning activities.

South Africa Education and Environment Programme — The South Africa Education and Environment Programme is a local programme which runs an environmental awareness programme in Cape Town schools.
Project partner Wastebuster promotes sustainable development education in the UK through its online web platform. This platform has been used with great success to deliver a national, cross-sector, curriculum-linked school waste and sustainable development education programme that supports delivery of the UN Sustainable Development Goals (SDGs). The platform is also used to deliver campaigns that encourage school children to engage families and households to collect and recycle material that might otherwise go to waste, thus unlocking its value.

However, rolling out an identical initiative in South Africa was not possible as many schools are located in remote areas and do not have access to the internet.

To respond to local needs for this pilot project, Wastebuster worked with local specialist consultants from JET Education, NECT and Takalani Sesame (Ochre Productions) to gain insight into the best possible approach.

“Although schools only represent a small percentage of the waste generated in a country, children represent 100% of tomorrow’s population. If informed, engaged, inspired and empowered to recycle and see the value and benefits of living more sustainably today, we believe they will help secure a more sustainable future tomorrow.”

Katy Newnham, Wastebuster

Wastebuster specialises in educational film productions and campaigns that inform, inspire and engage children. With the help of several Wastebuster puppet characters, including the iconic Captain Busta, a blue space monkey puppet from the Intergalactic Wastebuster Federation (see below), Wastebuster teaches children to care for the environment and understand the importance of responsible consumption and production. Such productions and campaigns support the citizenship, social health education and life orientation aspects of the education curriculum.

For example, Wastebuster’s Sport into Schools campaign, delivered as a formal London Olympics 2012 Inspire project, enabled schools to exchange unwanted textiles for sports equipment. The project taught children about recycling and the value of waste as a resource through Wastebuster online films, assemblies and classroom activities.

The initiative encouraged school children to collect as many unwanted textiles as possible and bring them to school on collection days. A textile merchant would pay Wastebuster an agreed amount for the material and children would be rewarded for their efforts with ‘Recycling Reward’ points on their school’s online accounts. The children could then exchange their points for new sports products on Wastebuster’s online Exchange Store.

Following the campaign’s success, the ‘Science into Schools’ campaign was launched to enable schools to exchange their points for both science and sports products. This ‘learning by doing’ brings relevance and reality into the classroom, which has qualitatively demonstrated increased learner motivation and engagement.
A MULTI-MEDIA APPROACH TO EDUCATION

The education pillar of the Virtuous Circle used multimedia channels to bring messages about recycling to life for the schoolchildren.

Working with the FUTURELIFE® Foundation, “smart posters” were designed and distributed to be displayed in classrooms. These posters were built around the slogan ‘smart nutrition, smart food, smart recycling – be smart’. They communicated not only the nutritious benefits of the FUTURELIFE® Smart food™ but also the incentives for recycling. Inspired by these tools, the schoolchildren were motivated to collect empty pouches which were recycled to create school desks for their classrooms.

The objective was to show the children that they themselves could have an impact simply by developing better recycling habits and positively influencing those around them, including their parents.

Working with Ochre Moving Pictures, the co-producer of Takalani Sesame, and Moonlighting Films, two of the most well respected TV and film production companies in South Africa, Wastebuster also helped to produce an online magazine show suitable for a South African audience. The show revolves around the idea of creating a circular economy for flexible packaging. In order to appeal to a South African child audience, Wastebuster took a typical South African animal, a rhino, and created a new puppet character called Bheji. Bheji explains to the children why reducing food waste is important, the role of packaging and how the pouches can be recycled into desks.

We feel the entertainment industry has the power and responsibility to produce compelling education materials, as well as entertainment. We agree with Wastebuster’s belief, that films with high quality production values have more potential to engage and inspire children. As such, we felt compelled to support this project and help unlock additional pro-bono support from industry professionals that also believe in the project’s mission.

Phillip Key, Moonlighting Films

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"IT IS IMPORTANT WE TEACH CHILDREN TO
RECYCLE. OUT OF RECYCLING YOU GET SOMETHING
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HEADTEACHER KHUMALO,
ALDINVILLE PRIMARY SCHOOL,
KWA-ZULU-NATAL, SOUTH AFRICA"
A special song was also released to support the project. 'Shake it', was written by renowned South African artist Tresor, with a helping hand from Wastebuster’s lead character, Captain Busta. The song promotes the benefits of good nutrition, explains to school children how to use the dual compartment pouches and demonstrates how appropriate packaging can help reduce food waste. It was trialled in one of the participating schools and the children choreographed and filmed a dance that was later shown to other school children involved in the project.

“I know what difference food and good nutrition can make to a child’s well-being and chances in life. I wanted to use my music to help positively engage children with the messages, whether they are in a feeding programme, or learning about the project, and what difference they can make. I hope the song can help the campaign engage hearts and minds, and raise funds to feed and educate more children – so they have better chances in life.”

Tresor

AN AMBASSADOR WITH A DIFFERENCE

TRESOR RIZIKI is a multi-award winning singer-songwriter and producer who has worked as a pro bono ambassador for, and hands on supporter of, the Virtuous Circle project. Having experienced first-hand the huge benefits that access to nutritious food during childhood can produce, Tresor is an enthusiastic and passionate supporter of the project. With his generous support and musical talent, the charity song ‘Shake it’ was born and hopes to deliver further success for the project.
As noted throughout this report, there is a clear need to raise awareness of the importance of recycling and care for the environment at grassroots level in South Africa. However, raising awareness of the problem is only the first step. To engage local communities, they need to be made aware of the advantages of taking action — not only in terms of their immediate environment but also in terms of how they can directly benefit. These challenges are not unique to South Africa, but there are specific factors in the country that present opportunities to stimulate behavioural change from the bottom-up.

For example, there is a clear opportunity to align key waste and sustainable development topics to the South African school curriculum. This includes incorporating environmental awareness programmes into the Life Orientation syllabus, and creating training and lesson modules for teachers.

A holistic approach would look to integrate working with schools and their broader communities. The aim is to not only raise awareness of the importance of recycling, but also to highlight how it can be used to create jobs, improve standards of living and enhance social mobility.

91% of teachers surveyed felt the children’s attitude to recycling was positively influenced by the fact that they knew the waste would be converted into a school desk.

SCHOOLS PROVIDE AN IDEAL OPPORTUNITY TO EDUCATE A LARGE GROUP OF COMMITTED AND ENTHUSIASTIC YOUTH ON THE CONCEPT OF RECYCLING, ALIGNING THE WORK THEY ARE DOING WITH THE LIFE ORIENTATION CURRICULUM. YOUNG PEOPLE CAN BE THE CATALYST FOR THE DEVELOPMENT AND DISSEMINATION OF IDEAS AS THEY CAN ASSIST IN MAKING THEIR PARENTS AND WIDER COMMUNITY AWARE OF THE IMPORTANCE AND BENEFITS OF RECYCLING.

Craig Gibbs, JET
The challenge lies in how to scale-up such initiatives, improving and centralising the bridge into schools and ensuring they have nationwide reach. Although many schools in South Africa have limited access to the internet, mobile technology provides a unique opportunity for teachers, parents and learners to access high quality training and teaching resources. In South Africa, as well as in many other African countries, there is an opportunity to capitalise on the growing connectivity that mobile technology provides to equip teachers with high quality, up-to-date classroom resources and training. This approach will also help ensure that teaching resources are factually correct in comparison with potentially outdated text books. Relevant and informed educational material that is linked to the UN SDGs is crucial to achieve sustainable development.

In response to these challenges, insights and recommendations from Virtuous Circle partners include:

- The clear potential to bring together disparate Education for Sustainable Development initiatives under one nationwide platform in South Africa leveraging and feeding into the Life Orientation school curriculum to centralise opportunities and act as a national bridge into schools.

- Developing a progressive learning pathway for sustainable development throughout all stages of formal education, that provides real life learning opportunities and a spring board into careers that will support circular economy development.

- The strong advantages of establishing a mobile app-based platform are clear. Not only would an app platform break down barriers to engagement, particularly for schools with limited access to data, but it would also act as a communications channel and campaign tool. The idea of a centralised resource database that hosts training and educational material to engage whole school communities builds on the experience of the Wastebuster platform in the UK. The objective would be for users with smart phones or tablets to be able to access, download and store content quickly and easily on their smart phones. Importantly, resources should be accessible without internet data access or connectivity.

- The critical importance of demonstrating clear rewards and incentives for both learning and recycling activities by teachers, school children and their local communities. An app-based platform could provide reward incentives for improved attainment and engagement in environmental and recycling challenges and campaigns. The incentives will range from accreditation, for teachers to be recognised for their skill sets, to store discount voucher systems for school children and their families. The aim would be to incentivise teachers to opt for sustainability themed learning modules and to tackle under-performing core subjects in the curriculum, such as maths.

- Effective data collection to measure learning and behaviour, including changes in knowledge, attitudes and awareness. Such data interrogation should be shared across sectors to identify a common formula for success.

- Cross-sector partnership working to create a more joined up, cohesive, national approach to education for sustainable development.

- Finally, in order to continue the successful work of the Virtuous Circle project, Tresor’s ‘Shake it’ song will be made available for download to raise funds for further donations of FUTURELIFE® pouches to participating schools. An official video will be distributed across South African and British schools to raise awareness of the campaign and to increase downloads of the song.

Endnotes:

1 Department of Environmental Affairs, Strategic Plan 2010 – 2015. Strategic Objective 3: Contribute to sustainable development, livelihoods, green and inclusive economic growth through facilitating skills development and employment creation
3 Ibid (pp 64)
4 (The show can be watched in full or as individual episodes on the Wastebuster educational platform and via Wastebuster’s YouTube channel)
CONCLUSION

The Virtuous Circle project set out to explore the full potential of multilayer packaging to contribute to a circular economy. The starting point was to look at how frangible dual compartment pouches can help child nutrition and tackle food waste in developing counties. The next step was to test innovative ways of continuing to derive value from this packaging after its initial use and contribute to new products of value to society. The common theme throughout the project was for the next generation to experience first-hand how effective waste management can have a directly positive impact on their own lives.

Like any pilot project, the ultimate goal was to identify how key findings could be rolled out on a larger scale – both in South Africa and in other parts of the world. The most important learnings from the project are summarised below:

There is huge potential for innovative packaging options to address nutritional and educational challenges among school children in developing countries, while tackling food waste at the same time. However, rolling this out on a nationwide basis would require scaling up government feeding programmes, as well as non-governmental donation-based initiatives.

There is a clear possibility for packaging solutions combining food and water to play a role in other settings. Cooperation among different stakeholders in the humanitarian aid sector is already underway.

Compatibilisers have a crucial role to play in “recycling the unrecyclable” and revolutionising value-adding end-of-life options for multilayer packaging films. New solutions in other sectors not covered by the Virtuous Circle project should continue to be explored e.g. transport.

However, it is critically important to ensure ongoing investment in packaging design and collection schemes, as well as innovative financing and policy support, to ensure this newfound potential is translated into reality on a significant scale.

Last, but by no means least, there is clear potential in a joined-up approach to Education for Sustainable Development in schools to drive behavioural change among future generations.
OVERVIEW OF PARTNER CONTRIBUTIONS

Coordinating partners

**DuPont** was the lead coordinating partner, and also produced the virgin resin that was used in the peel-seal layer of the multilayer pouches. Furthermore, DuPont provides recycling compatibilisers and coupling agents for the production of school desks and housing planks from multilayer waste.

**Amcor** produced the multilayer film and was one of the main financial contributors to the project.

**FUTURELIFE® Foundation** carried out project management in South Africa.

**Wastebuster** coordinated the educational activities for the school children on the importance of recycling.

**Wildlands** coordinated and carried out the distribution of the pouches to the schools, as well as transporting the waste from the schools to be recycled.

**RWPA** turned the waste pouches into pellets, using a process that involved compounding, recycling and extruding the pouches, as well as adding a compatibilisers to create a recyclate resin. These pellets were then used to make the school desks.
Contributing partners

**EqualTrade** manufactured the dual pouches free of charge, and also donated the purified water and the main line distribution within South Africa.

**FUTURELIFE®** contributed the ‘Smart food™’ that was used in the project and produced the ‘Smart Posters’, which were used to educate children about the benefits of nutrition and recycling.

**Moonlighting Films** recorded the project in action, and also produced the videos that are being used to promote the project.

**NECT** introduced the project coordinators to several Primary Schools on the NECT Education programme.

**NGR** provided support in running PET/PE structures on their recycling machines for the purpose of screening compatibilisers.

**Ochre Moving Pictures**, as the co-producer of Takalani Sesame, assisted with its expertise in children’s programming and the participation of Nyanga Tshabalala, the talent behind the performance of Bheji the Rhino. Ochre also consulted on the development of appropriate educational messaging strategies for South African children.

**Quantis** gathered and analyzed data about the project, which has been used throughout this report.

**Siegwerk**, a well-known global supplier of printing inks, provided inks for use in the FUTURELIFE® packaging, which have been tested and evaluated with respect to conformity and safety in terms of repeated direct mouth exposure. This was a prerequisite for making the use of inks in this type of packaging possible.

**Solae** contributed to the production of the food that was used in the pouches.

Desk sponsors