

Plastics Sector Competitiveness Strategy and Action Plan for Côte d'Ivoire

Final report

November 2019

List of Abbreviations

Acronym	Long form
CDI	Côte d'Ivoire
CE	Circular Economy
ECOWAS	Economic Community of West African States
EDW	Entrepreneurial Discovery Workshop
EPR	Extended producer responsibilities
HDPE	High-density polyethylene
LLDPE	Linear low-density polyethylene
LDPE	Low-density polyethylene
PE	Polyethylene
PLA	Polylactic acid or polylactide
PP	Polypropylene
PVC	Polyvinyl chloride
PS	Polystyrene
PET	Polyethylene terephthalate
rHDPE, rLDPE	Recycled high-density polyethylene, recycled low-density polyethylene
rPET	Recycled Polyethylene terephthalate
WASH	Water, sanitation and hygiene

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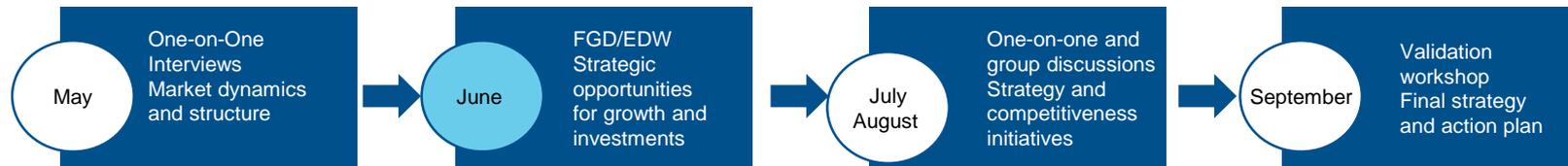
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Introduction

This document is based on findings from the first phase of the Invest in Africa – Côte d'Ivoire Manufacturing project involving desk review and one-on-one interviews with key stakeholders. In the next phase, the team will move from one-on-one interviews to a series of smaller group workshops to verify the information gathered and to disseminate new information among the industry. The preliminary results presented in this report serve as input for the focus groups and the EDW.

Overview of the Consultation

Stakeholder engagement process



The rest of the report is organized as follows: The next section presents key terms and concepts associated with the plastics industry in Côte d'Ivoire along with a stakeholder map of the CDI plastics sector. The following section provides information on firm structure, market size, and location. Also, the rapid appraisal of plastic subsectors is presented, followed by opportunities, constraints, critical success factors, and potential evolution scenarios. The recycling subsector is presented in the last chapter. The final part of the report contains the annexes, including specification of main types of plastic used in CDI, the profiles of firms and the background information used for the analysis.

Introduction

Concept and definition

For the purpose of this study, the concepts and definitions are understood as follows:

Category	Glossary / Concept
Plastics manufacturing	Plastics manufacturing is a process to convert plastic resin or compounds into finished products. There are different manufacturing methods applied. The injection molding process melts resin pellets inside an injection machine with a heated barrel. An auger moves the plastic forward and ensures an even mix of melted plastic. The machine then drives the melted plastic into a metal mold. Extrusion molding calls for a similar process as injection molding. The machine still melts the plastic. Rather than filling a mold with the plastic, the machine presses the melted plastic through a die that gives the plastic a fixed shape. Blow molding calls for the production of a hollow, pre-shaped length of melted thermoplastic, known as a parison. A mold closes around the parison. Air pressure forces the hollow plastic to expand into the mold shape, leaving the interior of the object hollow.
Linear Economy	Linear economy means that raw materials are used to make a product and, after its use, any waste (e.g. packaging) is thrown away. The traditional economy model is based on a 'take-make-consume-throw away' approach of resources. In an economy based on recycling, materials are reused. Embedded deep in the linear economy lies a toxic cocktail of negative consequences, ranging from social inequality, to depletion of natural resources, environmental pollution and worsening of the risks and effects of climate change.
Circular Economy	A Circular Economy (CE) is aimed at minimizing waste and making the most of resources. It is characterized by circularity, which represents a regenerative approach in which scarce resources are maintained in use for as long as possible. Circularity and recycling are connected, but they are not the same. Recycling takes us to the idea that waste becomes a resource for something else. In CE, when said resources have fulfilled their purpose, they are recycled into new products and materials.
Mainstream plastics	Mainstream plastic products are primarily comprised of conventional fossil-based plastic raw material. They can consist of both rigid plastics as well as flexible plastics. According to Anteja's initial research in Côte d'Ivoire, the production processes for mainstream plastic production include at least some of the following raw material inputs: polyethylene terephthalate; polyethylene; polyvinyl chloride; polypropylene; polystyrene; polycarbonate; acrylic; acetal polyoxymethylene; nylon; acrylonitrile butadiene styrene and others. Most of the mainstream plastic raw material inputs (resins) are imported from outside the country and are subject to price variations.
Recycled plastics	Plastics recycling is the process of recovering scrap or waste plastic and reprocessing the material into useful products, sometimes completely different in form from their original state. For instance, this could mean melting down soft drink bottles and then casting them as plastic chairs and tables.
Bioplastics	Bioplastics are biobased, biodegradable, or both. Bioplastics are an important part of the circular economy. The term ' <i>biobased</i> ' means that the material or product is (partly) derived from biomass (plants). For example, biomass used for bioplastics stems from corn, sugarcane, cellulose or similar sources. <i>Biodegradable plastics</i> are produced from materials that can degrade after usage through aerobic composting or by anaerobic digestion. One of the challenges with biodegradable plastics is the question of whether it is possible to procure sufficient biomass feedstock in a cost-effective manner in order to fulfill current production requirements.

Introduction

Concept and definition

The idea of having some “circularity” of resources use in economy is not new. Activities such as recycling, re-manufacturing, re-using products are already part of most industrialized waste management systems. The novelty of the Circular Economy (CE) is that it takes into account environmental, climate, social and economic impacts at the same time. CE requires the inclusion of all broad-range stakeholders from the public and private sectors, civil society, and consumers in policy and strategy formulation and implementation. In 2018, the WEF officially promoted the concept in collaboration with several governments and non-governmental organizations (NGOs) such as World Resources Institute (WRI) and Ellen MacArthur Foundation.

Linear Economy

- Linear economy is used to describe systems that produce products and wastes, all of which ultimately result in disposal and pollution in the environment. In other words, firms take raw materials and transform them into products. Products are purchased and used and, after their use, any waste is thrown away.
- The system is often inefficient, costly and harms the environment, biodiversity and health.
- Mainstream plastics are mostly in the linear economy.



Circular Economy

- A Circular Economy (CE) is aimed at minimizing waste and making the most of resources. It is characterized by circularity which represents a regenerative approach in which scarce resources are maintained in use for as long as possible.
- Circularity and recycling are connected, but they are not the same. Recycling takes us to the idea that waste becomes a resource for something else. In CE, when said resources have fulfilled their purpose, they are recycled into new products and materials.
- CE implies business models that emphasize sharing, valuing second life/recycled products and changes of consumer behavior.



EU and China have been global front runners of CE for decades. The CE is at the core of EU Plastic Strategy and China's five-year plan. China's ban on plastic further increases public worries around plastic waste and the view that plastic is a problem. There has been dramatic increase in private sector engagement in CE. This sector is exploring circular approaches as drivers of cost optimization along the whole supply chain. Advanced recycling technology using digital solutions and bio-based alternatives are preparing to respond to the plastic waste crisis with cost effective solutions and more eco-friendly plastic material.

Introduction

World plastics production

Plastics are one of the most versatile materials in the world. Almost all the products we use in our daily lives contain plastics. The developments in new materials and process technologies that have taken place over the past 150 years are of great importance. The use of plastics has increased twentyfold worldwide in the last 50 years and is expected to double in the next 20 years. The food packaging, medical, automotive, electronics, building construction, agriculture and textile industries all make extensive use of plastics. It is widely recognized that plastics play a crucial role in a sustainable future.

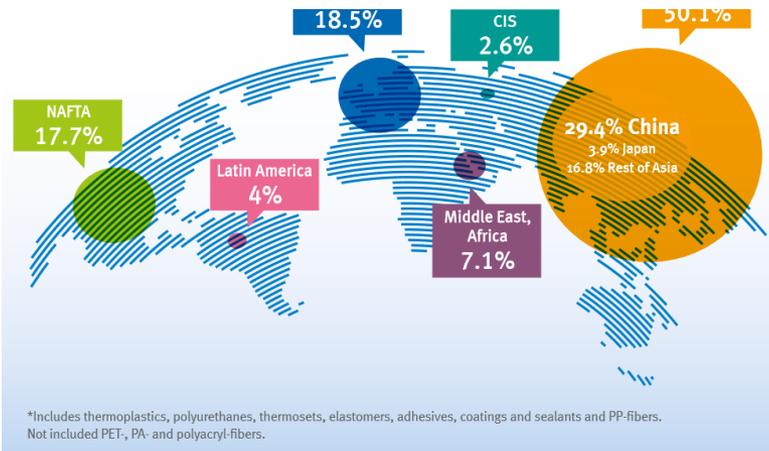
The world plastic reached almost 3,480 million tons in 2017. China is the largest single producer of plastic (29.4%), followed by Europe (18.5%), NAFTA (17.7%) and the US. Africa with Middle East presents about 7 % of its production. Packaging is the main application area for plastic in Europe, followed by building & construction and automotive.

PE (HPPE and LDPE), PET, PP and PVC are the prevailing polymer types applied in developed countries.

World plastics* production 2017

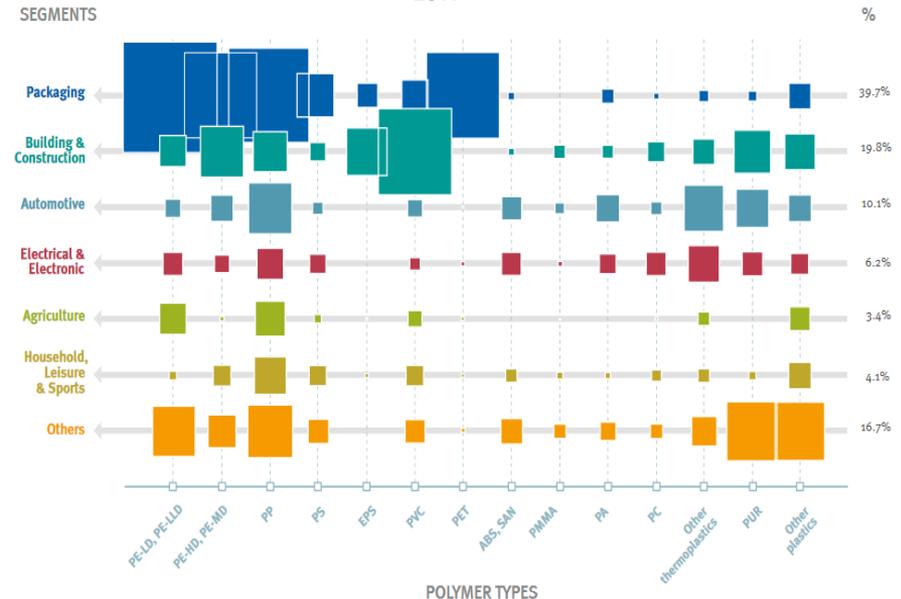
World plastics* production: 348 million tonnes.

Source: PlasticsEurope Market Research Group (PEMRG) / Conversio Market & Strategy GmbH



European plastic demand by segments and polymer types

2017



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Côte d'Ivoire Plastics Sector

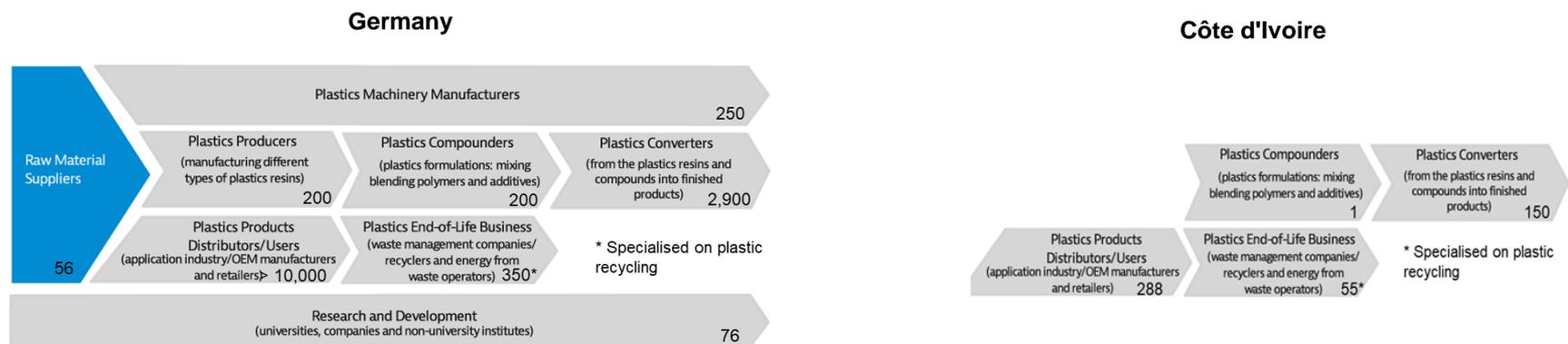
Plastics value chain overview

The entire plastic value chain typically consists of eight nodes as illustrated in the figure below. Starting with the raw material supplier, which can be based on fossil, virgin, recycled or bio-based plastics. In the next step, the raw material is further qualified by compounding and blending in order to give the plastic raw material the functionalities required for specific applications. Mainstream plastic manufacturers (or converters) turn the raw material (resins) into finished products, like bottles, pipes and tubes, etc. Plastic machinery manufacturers play an important role as plastic can be manufactured in very different ways. A close collaboration between the plastic machinery manufacturers and the plastic manufacturers themselves assures the latter groups to reply to changing demands coming from the distributors or end-users. In a circular economy, plastic end-of-life companies play an important role in collecting and recycling the used plastic.

When comparing the maturity of the plastic value chain between Germany and Côte d'Ivoire, it becomes evident that many nodes in Côte d'Ivoire are not covered at all or only by an under-critical number of companies. This results in a comparably short value chain for Côte d'Ivoire and a limited capability to create added value. A domestic plastic machinery industry as well as academia for research and development is entirely missing.

The plastic value chain

A comparison of the maturity of the plastics value chain in Germany and Côte d'Ivoire; estimation of number of firms given in the nodes



Côte d'Ivoire Plastics Sector

Main plastic products

The plastics industry has a long history in Côte d'Ivoire and remains dynamic with a high development potential. It contributes 7% to the value added by the manufacturing sector.

Companies in Côte d'Ivoire are mainly focused on manufacturing plastic products, with only one company involved in the preparation of resins. In Côte d'Ivoire, the plastics industry can be divided into five major sectors:

- Packaging,
- Shoes,
- Household & furniture,
- Building & construction,
- Agriculture

Other mainstream plastics manufacturing sub-sectors like automotive, electronics or health applications do not play any role in Côte d'Ivoire.

Examples for plastic products used in Côte d'Ivoire

	Sectors	Main plastic products applied in Côte d'Ivoire
	Packaging	<ul style="list-style-type: none"> • Solid food packaging (bottles, cans, etc.), • Flexible food packaging (foils, films etc.), • Plastic and garbage bags.
	Shoes	<ul style="list-style-type: none"> • Shoes, sandals, rubber boots.
	Household & Furniture	<ul style="list-style-type: none"> • Kitchen ware (crockery, plates, cutlery etc.), • Home articles, • Furniture (chairs, garden furniture etc.).
	Building & Construction	<ul style="list-style-type: none"> • Pipes and tubes (Sewage and water pipes), • Protection pipes / hoses, • Cladding and cables, • Plastic blinds.
	Agriculture	<ul style="list-style-type: none"> • Enforced bags for transportation, • Buckets, boxes, crates, • Films and foils.

Côte d'Ivoire Plastics Sector

Prevailing types of plastics

The variety of plastic products manufactured and used in Côte d'Ivoire reflects different types of plastic materials used. As indicated in the table below, there are six prevailing types of plastic, which are common. As the packaging industry is the dominating plastic sector in Côte d'Ivoire, Polypropylene (PP) and Polyethylene (PET) are one of the key materials. This sector includes containers, bottles, plastic bags and plastic films. It is used in various applications. Based on its molecular weight, there are different types of polymers of PET such as HDPE and LDPE.

Plastic materials and characteristics

SPI Code	Main Products and characteristics
 PET	Polyethylene Terephthalate (PET) is commonly used for production of bottles (water and soft drinks) and other household items such as medicine jars, rope, clothing and carpet fibre. This type of plastic is commonly recycled.
 HDPE	High-Density Polyethylene (HDPE) is used to produce a wide range of products such as milk and non-carbonated drinks bottles, motor oil, shampoos, conditioners, soap bottles, detergents, and bleachers, snack food boxes, toys, buckets, rigid pipes, crates, plant pots, etc. This type of plastic is regarded as very safe and has a high usage in food and drinks products. It is commonly recycled, however when recycled it is not safe to be reused for products containing food and drinks.
 PVC	Polyvinyl Chloride (PVC) is the base material of window and door frames, it is used for all kinds of pipes and tiles, etc. It is sometimes recycled.
 LDPE	Low-Density Polyethylene (LDPE) is used for many products such as, films, packaging films, squeezable bottles, plastic grocery bags, food bags, etc. It is sometimes recycled.
 PP	Polypropylene (PP) it is a strong material and used to make bottle tops, bottles for food products such as yogurt, ketchup, syrup, prescription etc., potato crisp bags, biscuit wrappers, crates, plant pots, drinking straws, etc. This type of plastic is only occasionally recycled.
 PS	Polystyrene (PS) is commonly used in products such as disposable coffee cups, plastic food boxes, polystyrene foam, seed trays, etc. This type of plastic is commonly recycled, but it is more difficult to do so.
 OTHER	This classification includes other plastic materials that are not defined by the six other codes. It includes materials such as Polycarbonate and Polylactide. Generally, products that are made from plastics of this classification are more difficult to recycle.

Côte d'Ivoire Plastics Sector

Mainstream plastics manufacturing market

Market related data are not systematically collected in Côte d'Ivoire and statistical data are available only for export and import. Therefore, the main source of data used for analysis is the following:

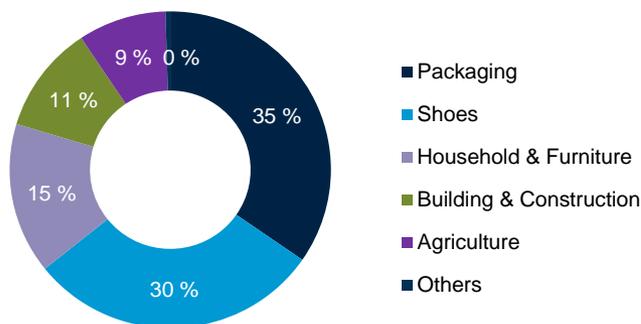
- Export statistics 2018,
- Export shares by sectors are calculated based on the firm interviews.

The domestic market for plastics manufacturing can be calculated for 2018 with a total of around US\$ 500 million or 335,000 tons. The largest share (around US\$ 173 million) is accounted for by the packaging sector. The shoes sector is the second largest, with nearly US\$ 150 million. Together with the household & furniture sector, all three sectors cover more than 75% of the total plastic manufacturing market in Côte d'Ivoire.

Based on interviews with Côte d'Ivoire firms, the productivity is 18 tons per worker per year, compared to 43 tons in Europe*.

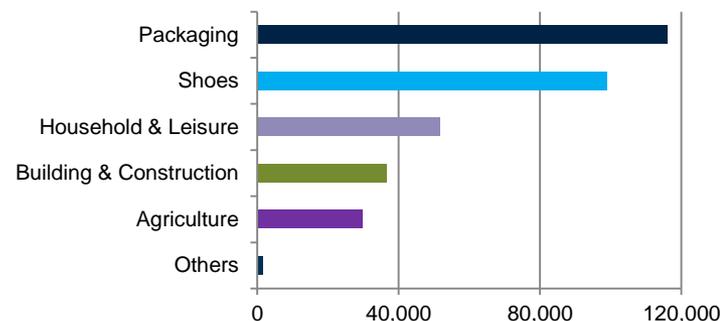
Composition of plastics manufacturing sub-sectors in Côte d'Ivoire

Total volume of about US\$ 502 million in 2018



Composition of mainstream plastics manufacturing sub-sectors in Côte d'Ivoire

2018



Tons

Côte d'Ivoire Plastics Sector

Firm structure

The mainstream plastics manufacturing sector is concentrated in three main locations (industrial zones) around Abidjan, namely Yopougon, South Koumassi, and Abobo. In total, around 500 firms are involved in the sector: 133 mainstream plastics manufacturers, 23 large end-users with their own plastics manufacturing facilities, 55 recycling firms, and 289 as end-users of plastic products from various sectors (e. g. food packaging, building and construction, agriculture or cosmetics).

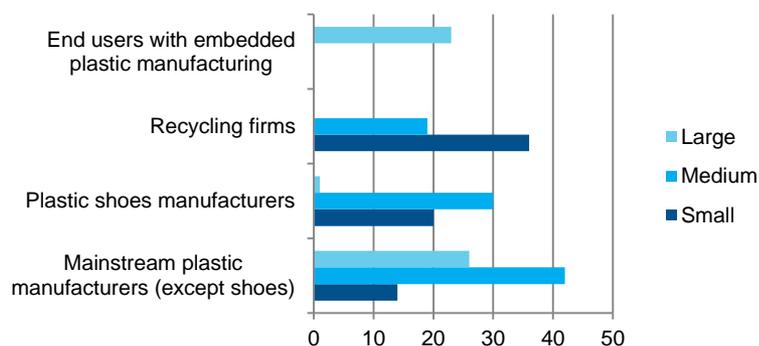
Firms structure and employment

- Medium size firms dominate the plastics industry. Most of the end-users with their own plastic manufacturing activities own very advanced equipment.
- The mainstream plastics manufacturing sector employs about 20,000 people and is comprised of 15,800 workers employed by mainstream plastics manufacturing firms. In addition, around 1,100 workers are engaged in plastics-related activities by large firms with their own plastics manufacturing facilities. Furthermore, the plastic shoes sector contributes 1,700 workers, whereas around 1,500 are working in the recycling sector.

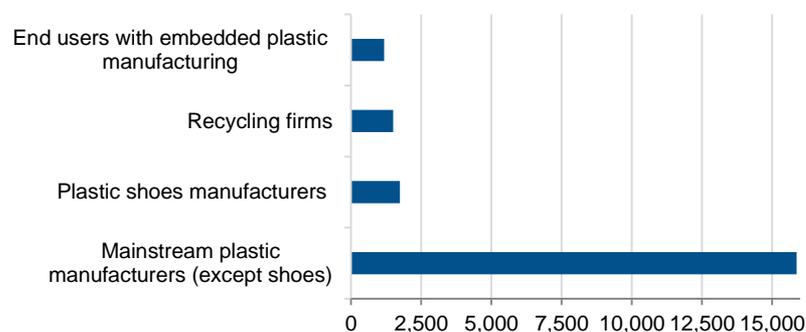
Firms concentration

- The South Koumassi area gathers a high number of plastic shoes manufacturers which have significantly benefited from the proximity of SCCI (leading plastics raw material supplier). The emergence of this shoe cluster can be traced back to 1970 when SCCI was established. A steady supply of material for shoes was secure.
- Abobo North is characterized by a high concentration of end-users from the agriculture sector.

Distribution of firms according to size*
2018

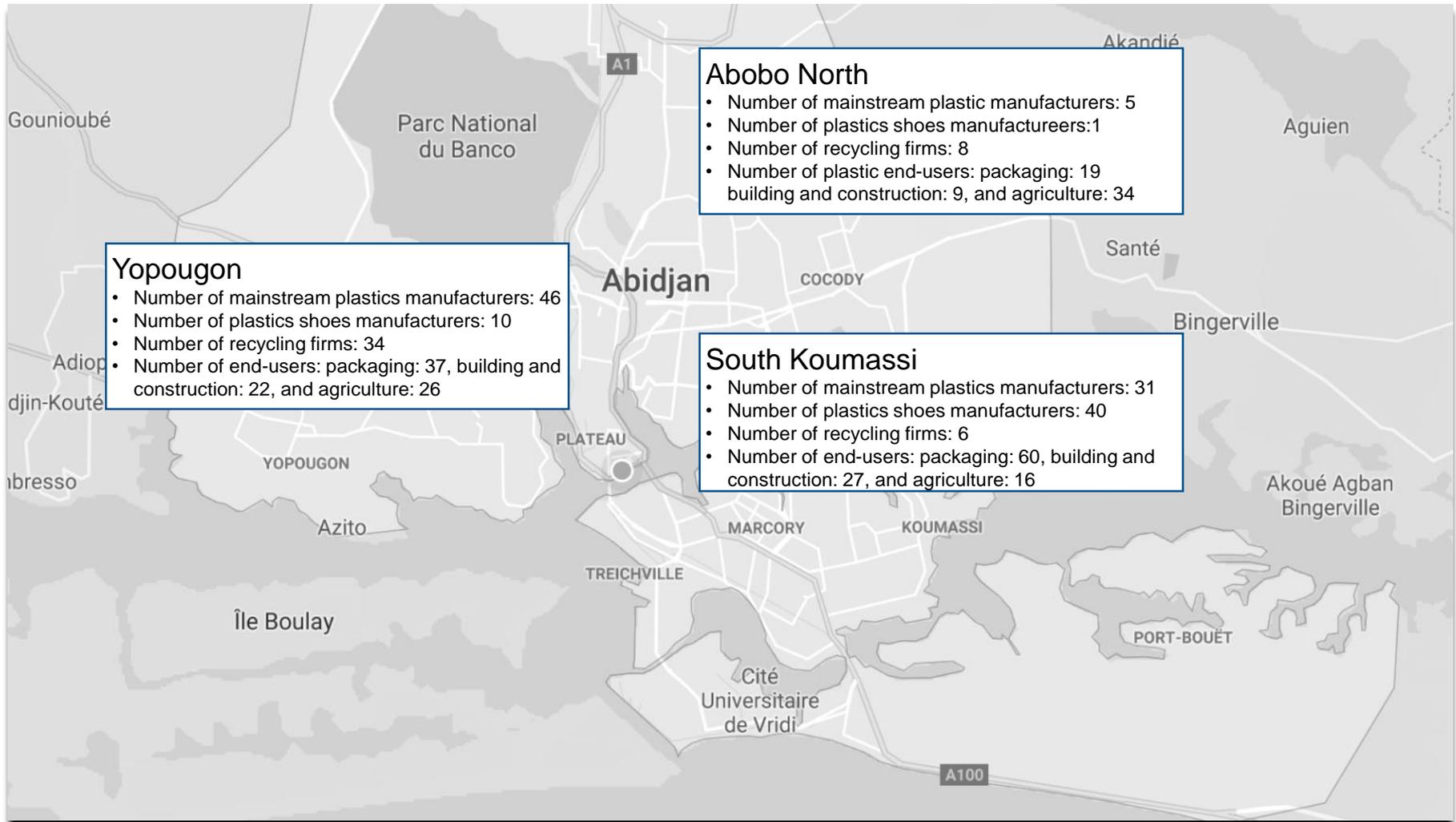


Employment
2018



Côte d'Ivoire Plastics Sector

Distribution and location of mainstream plastics manufacturers



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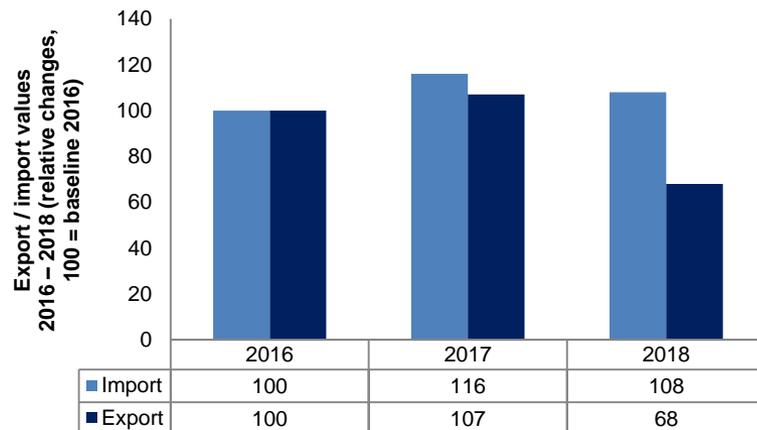
- Plastics firm profiles

Côte d'Ivoire Plastics Sector

Export performance

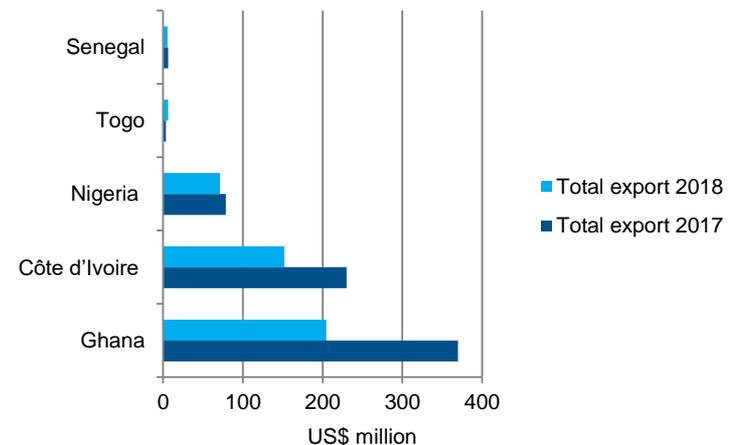
- Overall, the plastics sector in Côte d'Ivoire has a negative trade balance which has increased over the recent years from minus US\$ 195 million in 2016 to minus US\$ 293 million in 2018.
- While the level of imports has remained comparatively stable in recent years, exports for 2018 have declined significantly by 31%. This trend was mainly caused by the introduction of plastic bans in many key export countries. Due to this, the export of plastic bags and similar products affected by plastic bans dropped by more than 40% in 2018. By contrast, other sectors such as household & furniture or building & construction showed an increase in exports.
- Competitors, like Ghana, were affected even harder (45% decline in exports of plastic products) since they focused even more on plastic products affected by plastic bans. Nigeria was less affected as it mainly exports primary forms of plastics.
- Imports of plastic raw materials (resins) originate mainly from Saudi Arabia, China, India, and France.

Trade balance of plastics for Côte d'Ivoire over the past three years
2016- 2018



Development of total export of plastic products over last two years

Leading ECOWAS plastic export nations



Côte d'Ivoire Plastics Sector

Export performance

Export

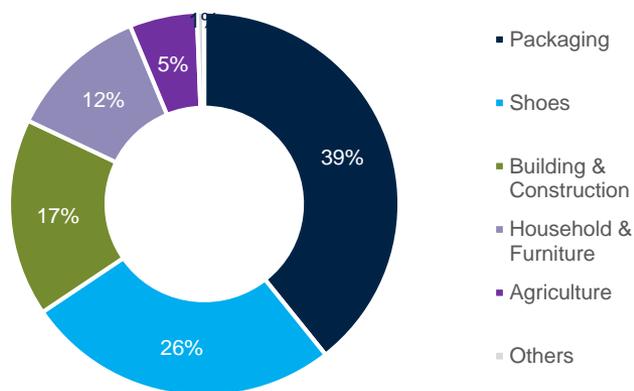
- Export is a key driver for the competitiveness of mainstream plastics manufacturers in Côte d'Ivoire.
- The export volume for manufactured plastic products was US\$ 198 million in 2018.
- Plastic products from the packaging, shoes, and building & construction sub-sectors cover over 80% of all exported plastic goods.
- 95% of all related export goes to ECOWAS countries.

Export shares

- The proportions of mainstream plastic products manufactured in Côte d'Ivoire significantly vary from one sector to another.
- The average export share can be estimated at around 40 %.
- In the field of agriculture, the export share of mainstream plastics products is comparatively low (25% to 30%) due to high local demand costs.
- By contrast, the building & construction sector achieves a higher export share of around 60%.

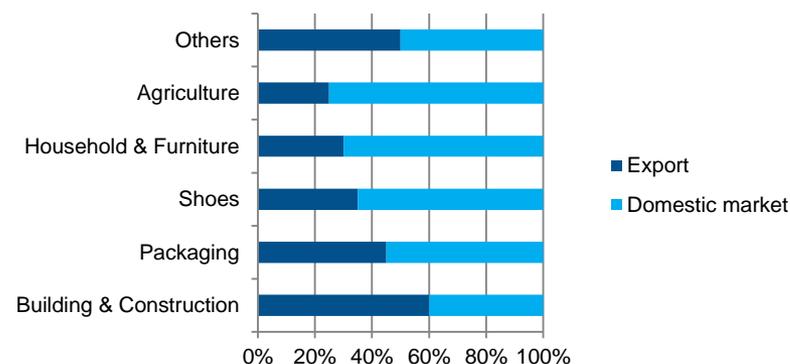
Export of manufactured plastics products per sector

Total volume US\$198 million for 2018



Export share per plastic sectors

2018

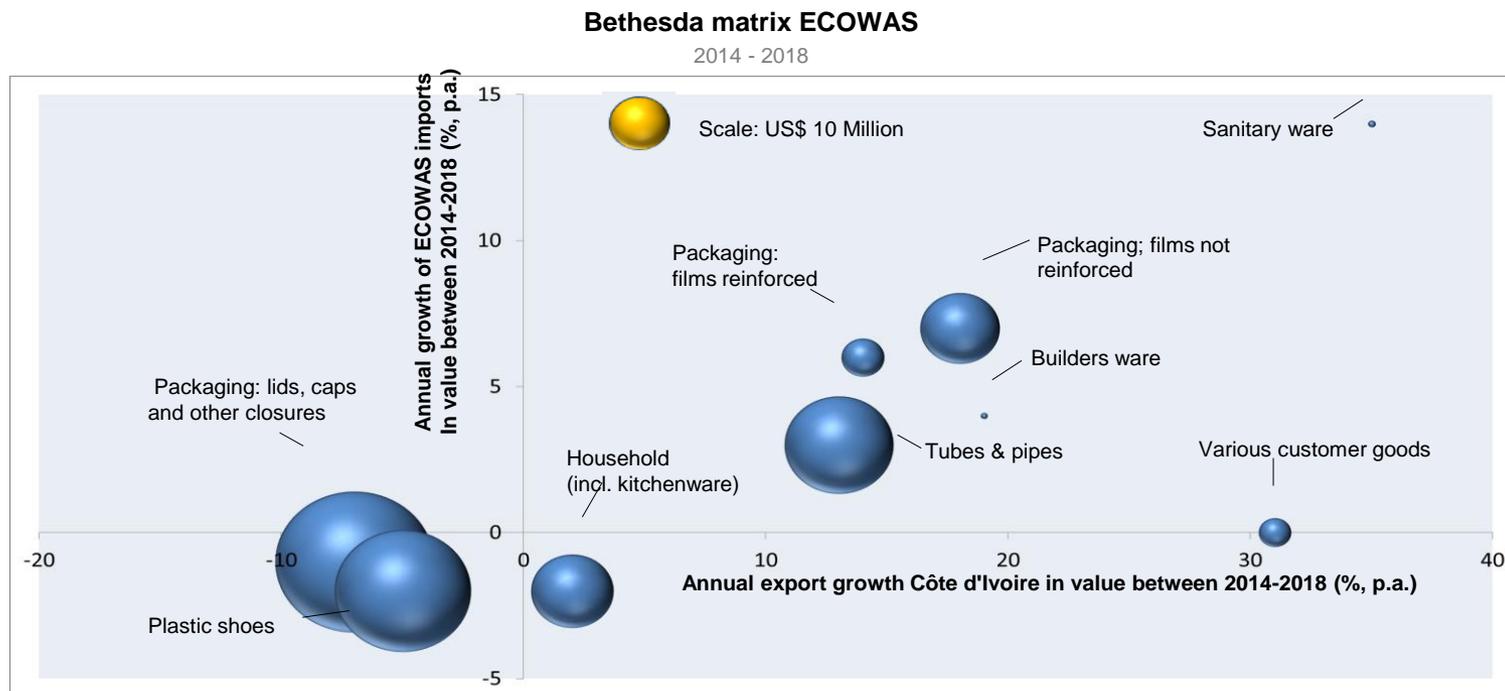


Côte d'Ivoire Plastics Sector

Export performance

Over the last five years, most of the plastic categories relevant for Côte d'Ivoire have shown steady export growth rates. Exceptions are plastic shoes and lids, caps and other closures for packaging, where Côte d'Ivoire is losing international competitiveness.

The categories listed in the upper right quadrant of the figure below represent those in which Côte d'Ivoire can be considered to be very competitive. This is because there are high annual export growth rates combined with positive import growth rates for ECOWAS countries. These account for 91% of all plastic exports from Côte d'Ivoire. Sanitary ware represents an interesting case. The ECOWAS market is growing and CDI exporters are gaining market share. The same applies to tubes and pipes as well as films and foils for packaging, where CDI remains in a strong position.



Côte d'Ivoire Plastics Sector

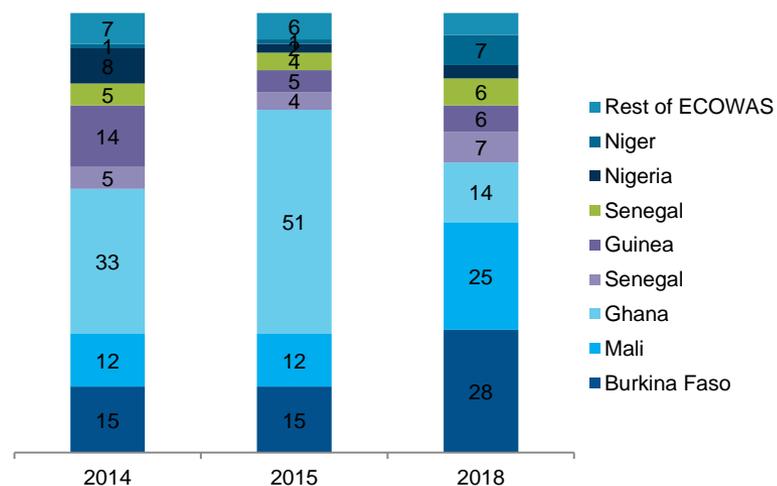
Export performance

Export

- A total of 95% of the products exported from Côte d'Ivoire go to ECOWAS.
- Burkina Faso, Mali and Ghana are key export markets. However, the importance of Ghana has declined, while Burkina Faso and Mali have become much more important. More than 50% of all exports go to both countries.

ECOWAS export market shares

2014 – 2018, values in percentages

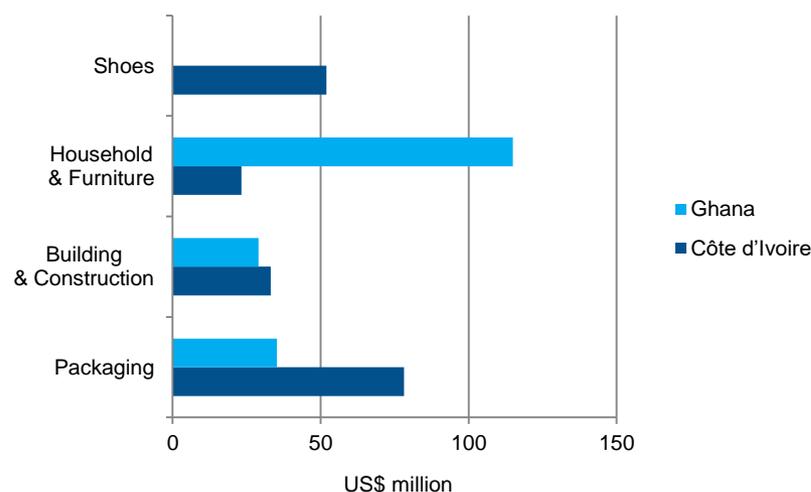


Benchmarking: Côte d'Ivoire and Ghana

- Côte d'Ivoire exports more products with higher value-added than Ghana.
- Côte d'Ivoire has a more diversified geographic distribution of exports.
- Ghana mainly exports household and kitchenware to Burkina Faso.
- Côte d'Ivoire is, by far, the most important plastic shoes exporter in the ECOWAS region.

Comparison of exported goods between Côte d'Ivoire and Ghana

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Competitiveness appraisal

The Competitiveness Appraisal Matrix (CAM) was used to assess the comparative competitiveness of different plastic sub-sectors for Côte d'Ivoire. The relative competitiveness of these sub-sectors was evaluated on the basis of three sets of criteria:

- recent performance
- forecast future performance
- readiness for transformation towards more circular ecosystem, e. g. higher amount of recycled plastic or bioplastics used.

Among the five dominating sub-sectors, the agriculture sector is expected to reveal the strongest performance in the future. This is mainly because of significant investments in future plastics manufacturing technologies are to be expected due to increased international requirements and customer needs for plastic products made of recycled plastics or bioplastics.

In high value-added plastic sub-sectors, like automotive, industrial electronics or health application, Côte d'Ivoire will likely not gain competitive advantages in the near future.

Competitiveness Appraisal Matrix (CAM) scores*

Three pillars: recent performance, future performance and level of readiness for transformation, total score max. 5

	Recent Performance	Future performance	Level of readiness	Total Score
<i>Weighting*</i>	<i>20 %</i>	<i>65 %</i>	<i>15 %</i>	<i>100 %</i>
Agriculture	0.86	3.25	0.70	4.81
Building & Construction	0.94	2.95	0.72	4.61
Packaging	0.90	2.95	0.72	4.59
Household & Furniture	0.93	2.95	0.63	4.51
Shoes	0.70	2.90	0.51	3.96
Industrial electronics / telecom	0.53	2.40	0.54	3.47
Health	0.20	1.45	0.18	1.83
Energy	0.20	1.30	0.15	1.65
Automotive	0.20	1.10	0.23	1.53

Côte d'Ivoire Plastics Sector

Key constraints and success factors

Key constraints

According to interviews with firms, the majority of constraints results from an unfair business environment. This includes unfair competition by the informal sector. The mainstream plastics manufacturing firms are moving from low-cost production to higher value-added production of goods. However, moving to high-end products and utilization of new materials and technologies is inherently linked to investment security and available workforce. Any reform requires cooperation along the value chain and dialogue between the public and private sector. The green imperative further creates the need for the development of institutions which can stimulate a continuous consultative relationship between buyers and sellers. Interviews conducted confirmed an immediate need for such an institution.

Agriculture

The agriculture sector is comparably less affected by sector-specific constraints. Unfair business conditions are key constraints for plastics manufacturing in the agricultural sector, especially with regards to low value-added products. The informal sector is currently flooding the market with such products. Moving to higher value-added products or using more biodegradable products (e. g. plasticulture) will help to cope with this constraint. Some overcapacities were reported, but much less than for other plastic sectors. The absence of export promotion activities hampers the export activities of many firms.

Building & Construction

Unfair business conditions are key constraints for the construction sector. This is mainly due to significantly delayed payments from the public sector which is normally the main investor in public infrastructure. Furthermore, export of complex goods is also considered to be problematic since the goods are often detained in custody for several weeks. Lack of skilled workforce is another constraint especially for those firms that use very advanced manufacturing technology.

Packaging

The packaging sector is affected by a broader set of constraints. Unfair business conditions hamper business growth in a similar way such as increasing overcapacities through domestic competitions. The national plastic ban is not fully implemented and is somewhat unclear. This has a negative impact on plastics-related businesses. Furthermore, the unpredictability of any future plastics policy on the part of the government has a negative impact on investment readiness.

Côte d'Ivoire Plastics Sector

Key constraints and success factors

Household & Furniture

Currently, the household and furniture sector suffers significantly from unfair competition caused by informal sector enterprises. Furthermore, current products are mostly of low value-added and thus exposed to significant overcapacity. In the recent past, the number of firms manufacturing household articles has increased. Sanitary and kitchen ware provides a good growth perspective for the future due to higher value-added inputs. To shift the manufacturing accordingly, a skilled workforce is needed.

Shoes

Also, the shoe manufacturing sector is significantly hampered by unfair business conditions and an increasing overcapacity in Côte d'Ivoire. Furthermore, the sector is exposed to heavy competition from China. Export promotion would help the sector keep its comparatively high level of export shares.

Summary of prevailing constraints for different sectors

	Agriculture	Building & Construction	Packaging	Household & Furniture	Shoes
Availability of biodegradable products	High	Low	Medium	Low	Low
Availability of recycled material with good quality	High	Low	High	Modest	Modest
Lack of cooperation	Modest	High	High	High	High
Tendency of overcapacity	Low	Low	High	High	High
Lack of coordination and private public dialogue	High	High	High	High	High
Unfair business conditions and customs	Low	High	High	High	High
Weak reinforcement of plastic ban	Modest	Low	High	Modest	Low
Lack of export promotion	Low	Modest	High	Modest	High
Lack of public support / awareness of importance of sector	Low	Low	High	Low	Low
Lack of skilled workforce	Low	Modest	High	Low	Low

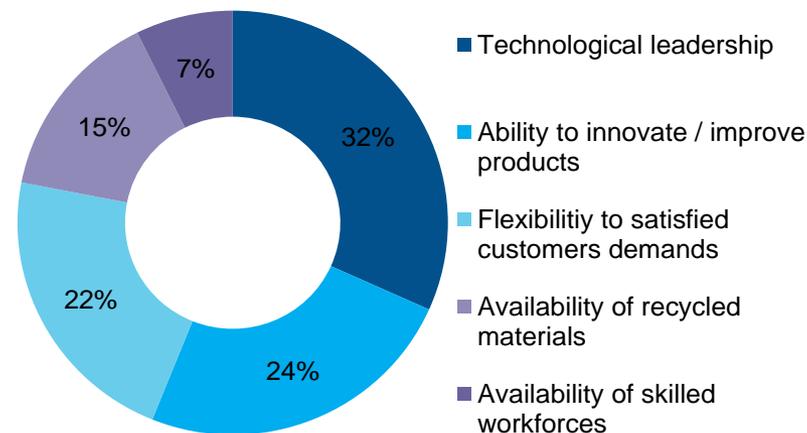
Côte d'Ivoire Plastics Sector

Key constraints and success factors

- There are several factors that are characteristic of the current position of the mainstream plastics manufacturing sector in Côte d'Ivoire.
- One of the prevailing ones is the technological leadership in the ECOWAS region. Export rates are especially high where higher-valued added products are manufactured.
- Many firms reported that their proximity to clients and end-users is creating long-term partnerships and allows the manufacturers to be involved relatively early in new product or design development process. Combined with the capability to reply fast and flexibly to the changing requirements of their clients, this situation is, without a doubt, a dedicated asset.
- More and more mainstream plastics manufacturers are concerned about the price and availability of virgin plastic raw material. More and more of them consider that having a sufficient supply of good quality plastic raw material becomes an important success factor.
- The availability of a skilled workforces is considered to be of relevance for a smaller number of firms. This is particularly the case where advanced manufacturing lines are in place.

Key success factors for mainstream plastics manufacturing in Côte d'Ivoire

Relevance according to firms interviewed



Sector Opportunities

Where is Côte d'Ivoire now and in what direction will it move?

Plastic Manufacturing Sector in Transformation

- Despite all environmental concerns, the plastic manufacturing sector is still growing and shifting from cheap commodities towards higher value-added products.
- Increasing demands of clients for flexible solutions (e. g. packaging solutions) or enhanced plastic functional behavior.

Drivers for change

- Increased domestic competition in one of the key drivers for continuous change of products and applications.
- Increased competition in ECOWAS markets urges Ivorian manufacturers to shift to higher value-added products and new applications.
- Increased convergence from manufacturing, digital printing, improved manufacturing technologies enables manufacturers to go for advanced products and materials

Current



Firm level Investments strategies

Markets

Existing markets

New markets

Existing markets	Further penetrating existing markets	Selling modified products in existing markets	Selling new products in existing markets
New markets	Selling existing products to new markets	Selling modified products to new markets	Selling new products to new markets



Future



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- Vision
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Sector Opportunities

Sectors with high growth opportunities

	<i>Opportunities</i>	<i>Challenges</i>
Agriculture 	<ul style="list-style-type: none"> • Biodegradable plasticulture products for organic production, especially mulching films and nursery pots, • Biodegradable packaging products, • Conveyance products based on recycled plastic material. 	<ul style="list-style-type: none"> • High reluctance of agricultural firms due to comparable high costs for biodegradable products. • Low awareness of community about positive environmental potential of biodegradable products (less pollution, fertilizer application etc). • Due to its difficulty to manufacture bioplastic products, today, only a limited number of plastic manufacturer is able to succeed
Building / Construction 	<ul style="list-style-type: none"> • High-performance pipes and tubes for new application fields (industry, mining, etc.), • Cables for electrical and telecom applications, • Eco-constructions: <ul style="list-style-type: none"> ○ 100% recyclable PVC, Bricks, floor covering and isolation material made of recycled plastic, • Windows and doors. 	<ul style="list-style-type: none"> • Limited market knowledge and access to building sector among plastic manufacturers . • Building and construction sector is quite traditional. Thus there is a high reluctance towards using new building materials (e. g. recycled plastic or plastic bricks).
Packaging 	<ul style="list-style-type: none"> • Multi-layer films, light weighting or designer packaging, • Flexible packaging solutions, • Digital printed packaging, • High-performance bags, • Packaging of hazardous good, • Bioplastic packaging: <ul style="list-style-type: none"> ○ Use of recycled and biodegradable material in all areas of application, ○ Cooperation with global firms (Nestlé, Coca Cola, Unilever, and recycling firms) to initiate efforts. 	<ul style="list-style-type: none"> • To successfully tackle new packaging opportunities, well-trained workforces and high investments in new packaging solutions and machineries are needed. • Increasing convergence with other technologies (e. g. digital printing) makes the packaging sector even more challenging to succeed. • Difficult sector for newcomers, since close relationship to end-users is needed. • Uncertainty about future plastic policy hampers readiness of plastic manufacturers to invest.
Household and Furniture 	<ul style="list-style-type: none"> • Sanitary ware, • Exclusive kitchen furniture, • Designer furniture, • Bioplastic household articles (made of bio-based plastic raw material). 	<ul style="list-style-type: none"> • Limited market knowledge of plastic manufacturers. • Additional competences, like design knowledge, is needed to succeed. • High costs if virgin plastic material is substituted by recycled or bioplastic. • Low profit margins and unfavorable business conditions in this sub-sector hampers readiness to invest
Shoes 	<ul style="list-style-type: none"> • Quality / designer shoes, • Composite material-based shoes, • Sports shoes, • Shoes for industrial and health application, • Cooperation with global firms (e. g. Adidas). 	<ul style="list-style-type: none"> • Price is dominating success factor in this sub-sector, especially since domestic shoes are considered a commodity. • Most plastic shoes manufacturers use outdated machine park. • Additional competences, like design, material or marketing knowledge, is needed to move to higher value-added shoes. • No local firm with strong market position exists that can act as front-runner in this regard

Agriculture Overview



National Development Plan 2016 to 2020 for Côte d'Ivoire foresees a total of US\$ 2,6 billion for investments in the agriculture sector. Moreover, Agriculture represents 17.4% of the country's GDP and accounts for 60% of its exports. The interviewees confirmed an increased demand for agricultural films, nets, pipes for irrigation, and fittings. Transparent and sustainable production is also growing in a similar way in Côte d'Ivoire. For organic production agriculture firms are purchasing more and more biodegradable material, mainly from Europe.

Market size and growth

- The current African market for agricultural films can be calculated with 8 % of the global market, valued at US\$ 320 million. African agricultural films market is expected to grow 5% over 2017-2022.
- The current market for plastic products used in the agriculture sector in Côte d'Ivoire's can be calculated with around US\$ 42 million.
- The market share of locally manufactured plastic products for agriculture is almost 80%.
- Ivorian export for high value-added, laminated films for agriculture application increased by 659% between 2017 – 2018.

Sector structure

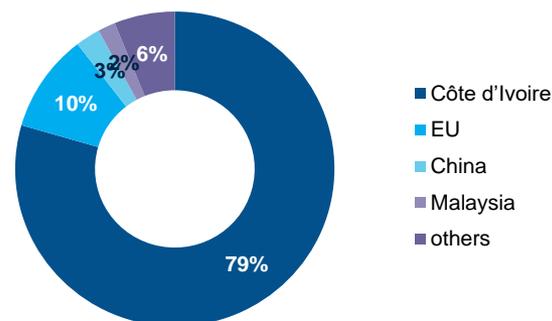
- Greenhouse films represent half of the current African agricultural films market
- This is followed by mulch films and about 20 % for silage films

Sector trends:

- **Plastic mulching**, which covers the ground with plastic film to maintain moisture and avoid contact between the plant and the ground. Ultraviolet (UV) blocking, fluorescent, and ultra-thermic films will reveal new product properties.
- **Biodegradable agricultural films** (mulch films, greenhouse films and silage films), which allow the use of such films to be a genuine contribution to a better environment.
- **Plastic films** for additional applications, like soil fumigation film, nursery pots, and silage bags.
- **Irrigation pipes** for supplying water to drip and sprinkle irrigation

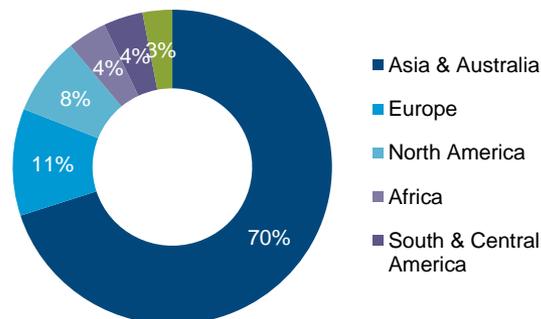
Plastic products applied for the agricultural sector in Côte d'Ivoire by country of origin

2018



Global demand for agricultural films by region

2018



Agriculture

Case study



Societe Asahel-Benin, a Benin-based blown film manufacturer used to make its plastic films by using polyethylene (PE) as well as recycle to manufacture its films that were then used predominantly in household products and in shopping bags for supermarkets. Over many years, Asahel Benin Sarl was a leading bags and household article manufacturer

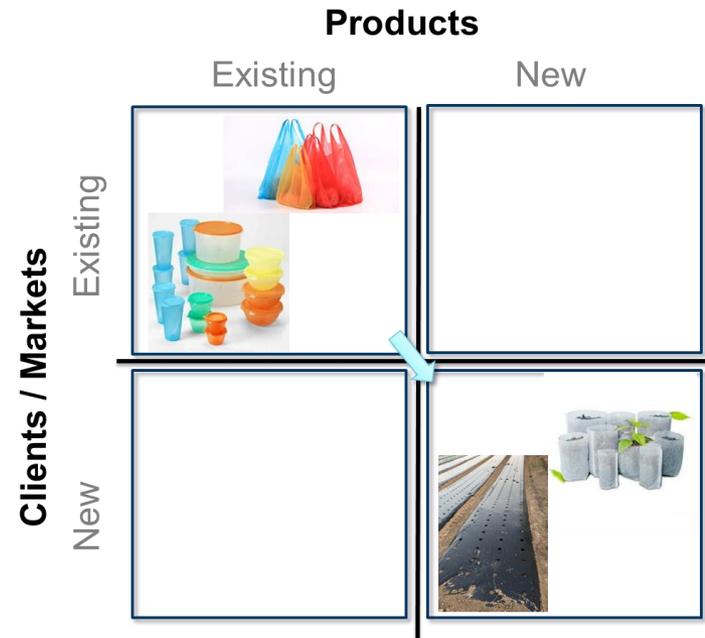
Challenge

- The new law on plastic ban in Benin forced the company to completely convert its production.
- On short notice, the domestic market for conventional PE-based bags and packaging production disappeared.
- Based on existing competences, new plastic products had to be identified and manufactured, which had a promising domestic market

Solution

- Asahel Benin decided to shift to biodegradable compounds, mainly for agricultural applications, based on PLA, which unite high production-technical demand with environmental sustainability.
- Biodegradable compounds manufactured by Asahel Benin are now food packaging, enforced bags for agricultural application and mulching films.
- Investments were needed for a new twin screw extruder, four highly accurate feeders and a completed compounding system.
- In the near future, even ordinary shopping bags might be manufactured by Asahel Benin

Diversification strategy of agriculture sector



Construction Overview



The construction sector in Côte d'Ivoire grew by 27% in 2016 for a total sector GCD of US\$ 1.6 billion. The entire West Africa region has a significant level of infrastructure projects underway with more than 93 US\$ billion in the last years. Plastics will more and more substitute other materials in the building sector due to their functional properties such as mechanical resistance, durability, lightness, thermal and acoustic insulation, flexibility and decorative qualities. Here, the real estate segment is an important driver for sectoral growth.

Market size and growth

- Côte d'Ivoire's long list of planned projects, from highways to bridges, to ports and stadiums will further stimulate growth.
- The current market for plastic products used in the building and construction sector in Côte d'Ivoire's can be calculated with around US\$ 41 million, of which US\$ 19 million worth of products are imported, mainly from Europe, China and Ghana.
- The overall market share of locally manufacturing plastics products for the building and construction sector is 53%.

Sector structure

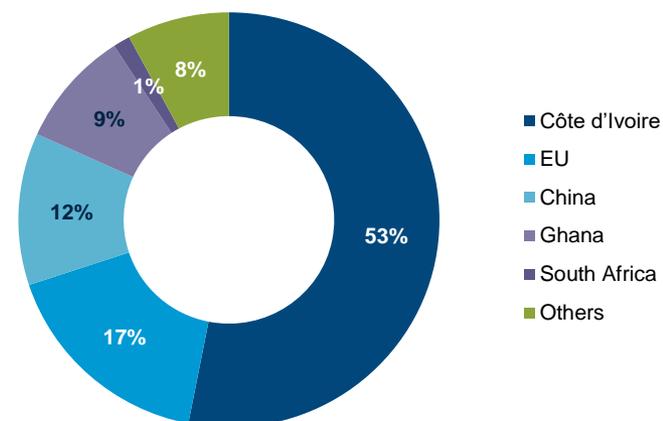
- Plastics products for building and construction are mainly made of PVC or HDPE and have gained significant market shares world-wide over time. They have replaced steel-based pipes because plastic pipes are cheap alternatives

Sector trends:

- **Pipes, tubes and fittings**, especially made of HDPE with better mechanical and wear resistant properties for construction, mining, water systems (drink and waste water), etc.
- **Doors and window frames** for the building sector.
- **Floor coverings** for increased safety and hygiene in household applications.
- **Bricks** are an affordable alternative building material and getting more popular when using recycled plastic material.
- **Insulation material** for construction (sandwich technologies) for high quality in the building sectors.
- **Cables** for electronic and telecommunications applications in houses.

Plastic products applied for the building and construction in Côte d'Ivoire by country of origin

2018



Construction

Case study



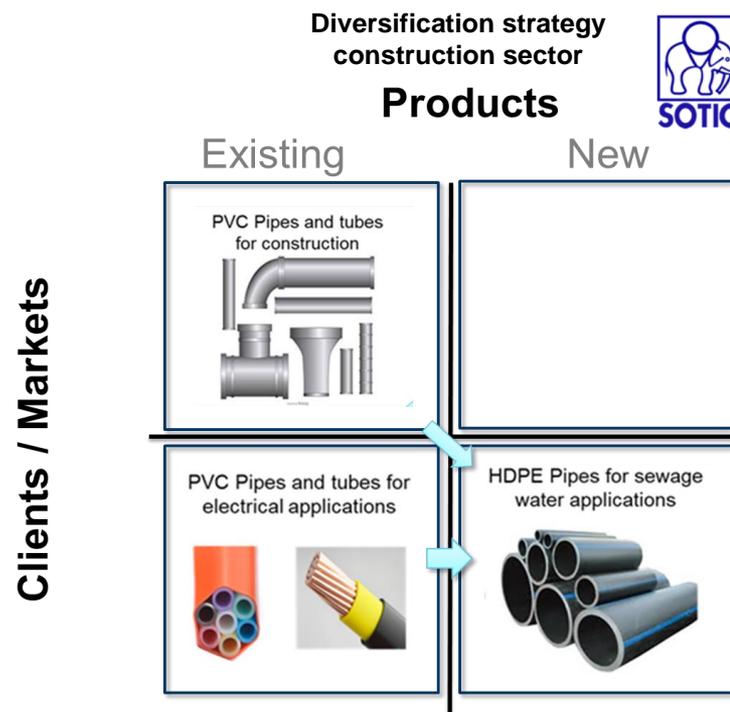
SOTICI was created in 1973 and currently employs 350 permanent and 350 temporary workers. It produces around 40.000 tons of tubes and pipes for various applications. The firm has a complete range of PVC pipes, PE and PVC connections ranging from diameter 15 mm to diameter 800 mm. The plant has a fleet of 15 pipe production lines, a drilling workshop and fitting manufacturing workshops. The firm also produces a full range of network and drilling materials

Challenge

- SOTICI is well known for its close relationship to its clients and its ability to find innovative solutions. As a result, SOTICI identified the increasing demand of the construction industry for products with better mechanical properties and higher wear resistance.
- Pipes and tubes made of HDPE were identified as a suitable plastics material that could better satisfy the demands of construction sector. However, tubes and pipes made of HDPE can not be manufactured like those made of PVC. Thus, new manufacturing solutions were needed.

Solution

- SOTICI's approach to cope with the challenge was twofold. First, SOTICI extended its product spectrum from tubes and pipes for fresh and sewage water applications to cables for electrical applications for which much smaller tube diameters are needed. PVD / PP was used for this purpose since SOTICI was experienced in manufacturing this material. By doing so, SOTICI was able to approach new clients, mainly from the building sector.
- In a second step, SOTICI invested in an entirely new manufacturing line (extrusion) to manufacture HDPE with a broad range of diameter (15 – 800 mm). Nowadays, SOTICI is able to cover almost the entire spectrum of plastic-based pipes and tubes for application in the building and construction sector. This allows a broad diversification of clients according to their specific needs.



Household and furniture

Overview



Plastic household articles and furniture have significant advantages, including affordability, ease of use, mostly unbreakable, variety of colors and designs, waterproof, rustproof and childproof. The hunt for lightweight and affordable materials in the household and furniture is leading to the introduction of plastics instead of heavy-weight metals in modern furniture design.

Market size and growth

- The plastic furniture market in Côte d'Ivoire grew at an average rate of 4.4% between 2013 and 2017, as the market gained momentum with the development of high-performance plastic materials suitable for manufacturing of durable plastic furniture.
- The current market for household application and furniture products in Côte d'Ivoire's can be calculated with around US\$ 81 million, of which products worth US\$ 27 million are imported, mainly from Europe, China and Ghana. The market share of locally produced plastic products is about 67%.
- The Côte d'Ivoire's export growth for sanitary products is 27% from 2016 to 2018. This may reflect the fact that manufacturers from Côte d'Ivoire are tackling a higher value-added market.

Sector structure

- XXX

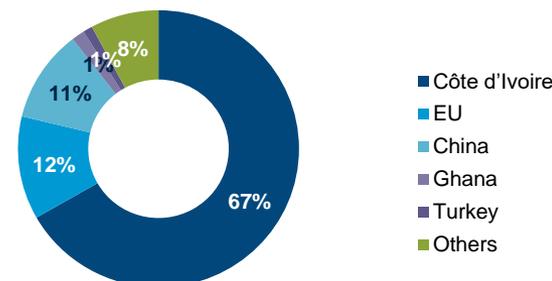
Sector trends:

- **Higher value-added plastic furniture** is a dedicated trend. This is the case for garden furniture or designer furniture. Plastics is a very appropriate alternative compared to wood or metal.
- **Sanitary ware**, both basic and high-end products, like toilet sink/water closet, wash basin, pedestal, and cistern.
- **Household ware is increasingly** made of **recycled plastic** or even **bio-based plastics**. There is a dedicated trend towards such products with increasing concerns for plastic pollution in the public. While this is still mainly in Europe, increasing wealth in Africa is leading to greater openness toward such products.

Value of sanitary products per ton
Period from 2016 – 2018



Plastic products applied for the household and furniture in Côte d'Ivoire by country of origin
2018



Household and furniture

Case study



The German based firm ajaa! was just established a few years ago, currently employing around 20 workers. The overall strategy of this firm is to manufacture and offer sustainable plastic-based goods for household applications. It focusses on those products, which can be used for a longer period of time. Ajaa! identified organic supermarkets as suitable distribution channel, since the key clients are also those who buy healthy bio-food

Challenge

- The key challenge was to find a supplier of bio-based plastic raw material that was ready to deliver even smaller amounts of raw material (less than 100 ton p. a.).
- Bio-plastic raw material is typically difficult to manufacturer due to its brittle behaviour. Only softener, which were not harmful to health, could have been used (no Bisphenol)
- Since products should be used over a longer period, they had to meet dishwasher-safe.

Solution

- ajaa! found a sugar cane based raw material supplier for 75 tons p. a. The supplier also helped Ajaa! to develop the entire compound.
- Since 2017 ajaa! offers a wide spectrum of household applications. The products spectrum covers over 10 different items.
- The price for ajaa! products is 5 times higher than ordinary PE-based household products, but due to its long term usability, the related products are competitive
- Strategic partnerships with different organic supermarkets, assures optimal distribution channels and direct access to clients
- Recently, ajaa! introduced household storage boxes, also based on bio-plastic



Packaging Overview



Consumer market growth is a key driver for food packaging consumption. Consumers in general are progressively shifting to more processed and prepared foods with emerging questions related to safety and quality. This leads to plastic packaging in food and beverages ranging from water in plastic bags to more sophisticated three-layer packaging materials. Flexible packaging is definitely a key driver for the future packaging solutions. Much of this growth is due to material and production advancements. Similar trends on a lower level can be seen in Côte d'Ivoire.

Market size and growth

- Currently, the annual volume of bottling of water is over 400,000,000 units, growing by double digits every year in Côte d'Ivoire. Current annual production of edible refined palm oil in PET bottle is around 400,000 units and 40,000 PE cans. Related firms expect double digit growth rates in the coming years.
- The current market for plastic packaging in Côte d'Ivoire's can be calculated with around US\$ 142 million, of which products worth US\$ 46 million are imported, mainly from EU. The market share of locally produced plastic products is about 68%.

Sector structure

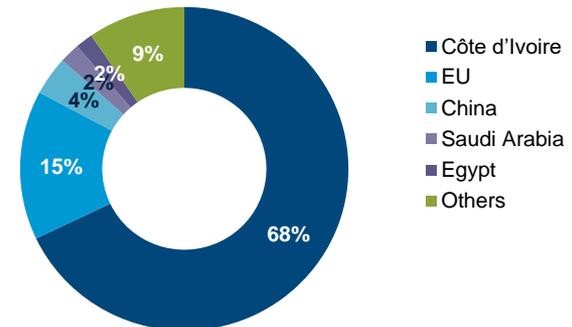
- Nestlé and Unilever are requesting new packaging solutions from local plastics manufacturers. With an emerging change in habits, plastic packaging for such consumers will be growing.
- The circular economy, recycling, eco-design, and the use of biomaterials will set trends in new developments.

Sector trends:

- **Multi-layer films** for packaging of margarines, mayonnaise, and tomato paste.
- **Smart packaging** aiming to increase the shelf life of products, reduce food waste, reduce loss, damage, waste, and cost in the supply chain.
- **Plastprintpack solutions** for designer packaging since end-user brands will have to try harder to stand out,
- **Bottles** for hazardous chemicals.
- **Various packaging solutions** made of recycled plastics or bioplastic.

Plastic products applied for packaging in Côte d'Ivoire by country of origin

2018





Packaging

Case study

Rehau AG is a well established packaging solution providers in Germany. The firm was founded in 1948 (Rehau Plastiks GmbH). Over the first two decades Rehau AG started to substitute conventional consumer products by plastic. Over time the firm specialised at tubes for medical applications. A milestone was reached when tubes from Rehau AG were applied during the first German heart operation with a heart-lung machine in 1957. Increased global competition urged Rehau AG to diversify over time by moving into the packaging sector for medical and pharma products. RAUMEDIC has been founded as a spin-off of Rehau AG in 2004 with a dedicated focus on new packaging solutions for medical and pharma applications. Recently, RAUMEDIC further diversified to become a technology leader for anti-counterfeiting of products.

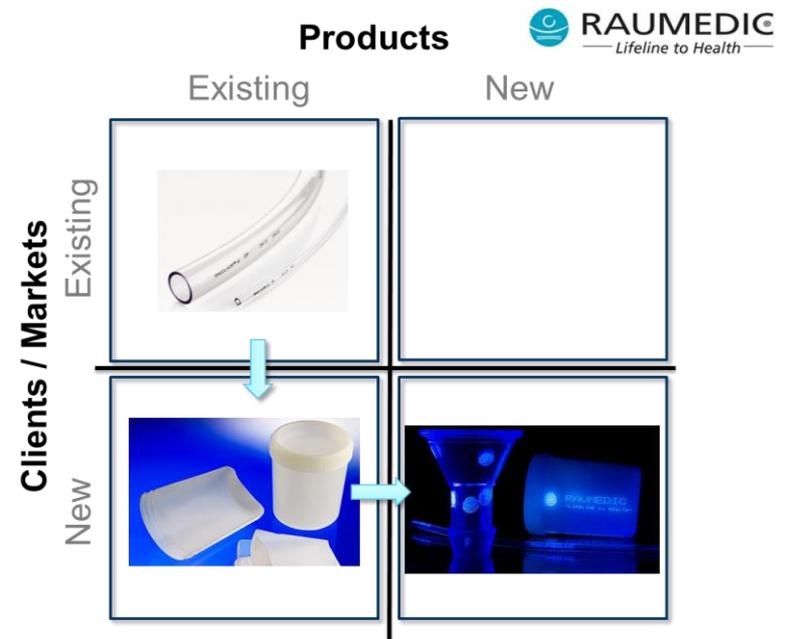
Challenge

- The counterfeiting of products causes significant damages to the pharmaceutical industry world-wide.
- Making better use of packaging to cope against product piracy.
- Integrate such solutions into the entire packaging process without lowering productivity or compromises in terms of packaging design or material.

Solution

- Already in the development phase of packaging solutions, the technology developed by RAUMEDICs is able to apply various options for making products more secure. The approach for protection against product piracy concepts is based, among others, upon the application of the different technologies depending on the products to be protected
- Most common and affordable solution is the laser marking or UV labelling of packaging, which is invisible for the clients, but visible under laser and UV light.
- The technology applied is called in-mould labelling without any need to modify the packaging itself.
- Laser marking or UV labelling can be used for various plastic packaging materials.
- The next generation of packaging concepts against product piracy will be based on using RFID technology or microparticles.

Diversification strategies packaging sector



Shoes

Overview



Plastic footwear is intended to protect and comfort the human foot while protecting against environmental adversities like weather, rocks, etc.. Footwear widely varies in style, complexity, and cost and also according to the weather of the particular region. Due to advancements in manufacturing processes, technology innovation and integration, comfortable shoes are being continuously developed in order to keep pace with the growing demand for footwear products worldwide.

Market size and growth

- The global footwear market is expected to garner US\$ 372 billion by 2020, registering a CAGR of 5.5% during the forecast period 2015 - 2020.
- The plastic industrial safety footwear market demand may benefit from average gains of over 2.5% by the end of foreseeable timeframe.
- The current market for footwear in Côte d'Ivoire can be calculated at around US\$ 111 million, of which products worth US\$ 14 million are imported, mainly from China. The market share of locally produced plastic products is about 87% compared to 10% for China.
- The export to most ECOWAS countries is constantly growing over the last year. Guinea (US\$ 20 million) and Nigeria (US\$ 6,5 million) are the prevailing export markets for Côte d'Ivoire.

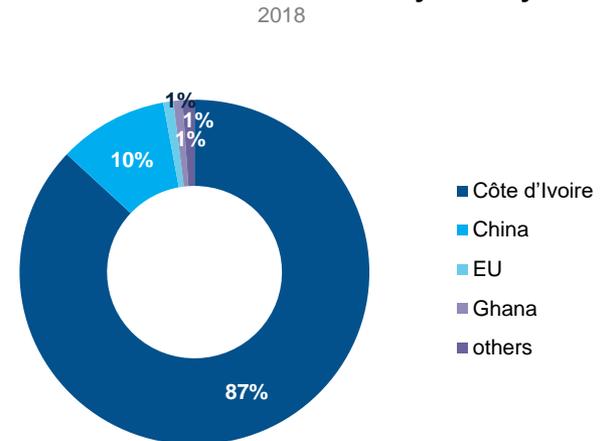
Sector structure

- The footwear sector can be divided into groups: athletic footwear (running and cross training shoes, soccer shoe, and hiking shoes) and non-athletic footwear (e. g. casual footwear, military boots, rubber boots and others).

Sector trends:

- Consumers increasingly prefer the idea of a shoe that does more for them. The onslaught of “multi-purpose” will continue to increase over the next few years. Consumers want their shoes to tell them about their personal habits, like the Nike+ system.
- Orthopedic and safety shoes can become niche markets in Côte d'Ivoire with comparably high profit margins.

Plastic footwear market in Côte d'Ivoire by country of origin



Shoes

Case Study



The global footwear industry is under constant transition. Multinational firms like NIKE and ADIDAS can be seen as trendsetters by investing billions in new designs, new footwear concepts and new materials. However, there are recent examples that illustrate that even small, unknown shoe manufacturers can benefit from this transition process.

Challenge

- The challenge is less on the manufacturing side.
- The fact is that mainstream plastics manufacturers operate quite disconnected from end-users.
- Shoes manufactured in Côte d'Ivoire are considered as a commodity which must be cheap.
- There are no national brands, which can leverage national and international footwear trends from which the plastic shoes manufacturing industry can benefit. The domestic market, valued of US\$ 110 million, should be considered big enough for such national trendsetting.

Solution

- One firm, TOMS shoes, just emerged in 2006. Its business model is to design and manufacture shoes that can be used for all purposes. This concept is absolutely contradictory to many fashion trends.
- However, TOMS shoes set out to allow poorer children worldwide to have access to shoes which they can wear for all purposes. In the end, it turned out to be a very clever approach, as Tom shoes are now bestsellers world-wide. Another firm, Skechers, modified the soles of shoes in a way that clients believe wearing them will improve their shape and body health.



Conclusion

Relative ranking: Strategic options and mid-term interventions

The plastics manufacturing sector of Côte d'Ivoire can be estimated at approximately US\$ 500 million in 2018 and thus, making it an important sector. At the same time, this sector is constantly changing due to increasing environmental concerns and industrial transformation. This leads to a highly dynamic plastics manufacturing market and offers significant opportunities for Côte d'Ivoire, both in terms of higher value-added products as well as in terms of increased use of recycled plastics and bioplastics.

	<i>Strategy</i>	<i>Interventions</i>
Construction 	<ul style="list-style-type: none"> Dual strategy focused on introduction of new products made of plastic as bricks and maintain a constant growth rate of pipes and tubes consumption thanks to the upgrading of urban water supply and sanitation networks and their extension to suburbs or towns that are not yet connected. Furthermore, housing demand is expected to increase by more than 10% per year, due to urban expansion and renovation, and national social housing construction plans. 	<ul style="list-style-type: none"> Numerous intervention options with a variety of actors. Focus on products diversification and quality improvement
Agriculture 	<ul style="list-style-type: none"> Introduction of new biodegradable plastics irrigation products and films Focus on entry points like nursery bags or mulching films with high pressure to assure biodegradability. If the plastic manufacturing industry can successfully cope with these challenges, over-average growth rates can be expected. 	<ul style="list-style-type: none"> Main focus on plastic raw material diversification and quality. Few obvious entry points for tangible, near to mid-term change.
Packaging 	<ul style="list-style-type: none"> Focus on innovative packaging solutions for the plastics manufacturers. The shift towards new packaging materials enabled by flexible manufacturing solutions (recycled plastics and bioplastic) provides new growth options. 	<ul style="list-style-type: none"> Plastic ban policy have been deployed Numerous interventions options with a variety of actors. Stimulation investments in flexible manufacturing enables new packaging solutions
Shoes 	<ul style="list-style-type: none"> Potential product opportunities are enormous, but hindered by limited investments in available machine parks Investment in flexible manufacturing is needed to reduce production costs even for small product volumes 	<ul style="list-style-type: none"> Need of investments to upgrade the available machine parks towards flexible manufacturing.
Household 	<ul style="list-style-type: none"> Ambitious housing programs, higher income and increasing hygiene standards will lead to higher demand for plastic 	<ul style="list-style-type: none"> Main focus on products diversification. Few obvious entry points for tangible, near to mid-term change.

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Circular Economy in Côte d'Ivoire

Introduction

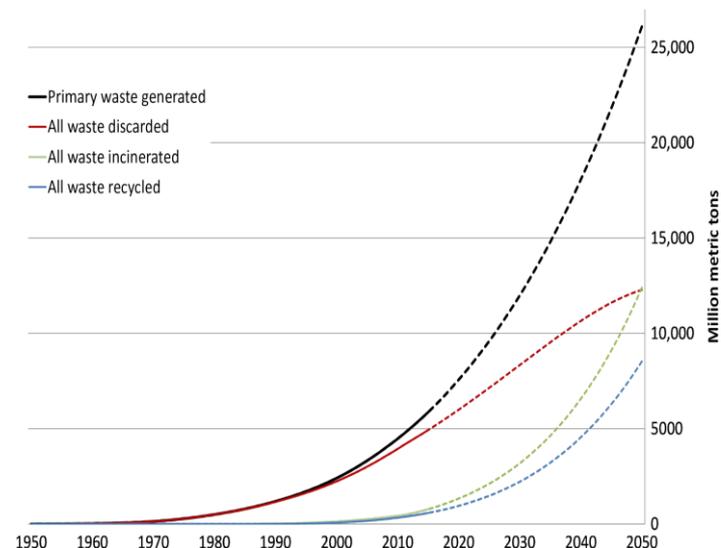
The high functionality and relatively low cost of plastic means that this material is increasingly present in everyday life. Mechanically strong, light in weight, the material's near-exponential growth has enabled many aspects of modern life. However, its lack of incorporated end-of-life considerations has created a global waste crisis.

Most plastic is only in use for one year or less. Furthermore, most of the commonly used plastics are not biodegradable. They can only be permanently eliminated by thermal treatment such as combustion or pyrolysis. Their increasing accumulation harms both life and economies.

- Plastic bottles and wrappers remain in the environment for about 450 years. Plastic bags up to 1,000 years to decompose,
- Cosmetic products (toothpastes, body washes, and make-ups) contain microbeads that bypass water treatments and flow into water system,
- Microplastics mostly derived by surface weathering degradation of plastic debris ubiquitous in soil rivers, lakes and oceans. Latest research shows that microplastic is in our food and water, but possible health effects on people and ecosystems have yet to be determined.

World-wide approximately 6,300 Million tons (Mt) of plastic waste had been generated, around 9% of which had been recycled, 12% was incinerated, and 79% was accumulated in landfills or the natural environment by 2015. If current production and waste management trends continue, roughly 12,000 Mt of plastic waste will be in landfills or in the natural environment by 2050. Africa has the highest rate of unsound waste disposal with an average of 88.5%, resulting in a total of 17 Mt of unsoundly disposed plastic waste.

Cumulative plastic waste generation and disposal
Period from 1950 - 2050



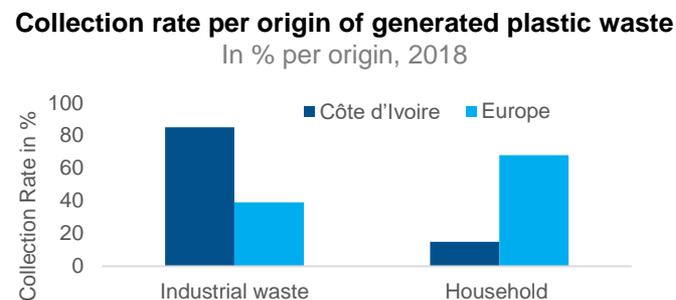
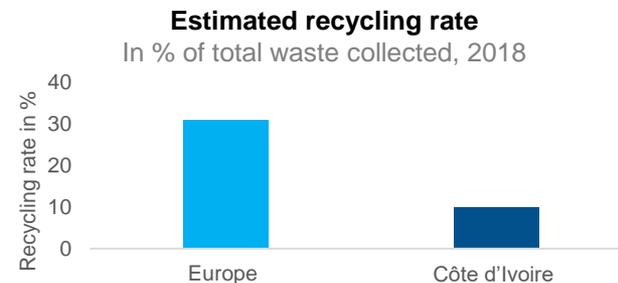
Circular Economy in Côte d'Ivoire

Demand and supply

Waste generation and recycling rate. Plastic waste is estimated at 190,000 - 200,000 tons per year. Plastic recycling worldwide remains consistently low with a rate of less than 10% compared to around 30% in Europe. Furthermore, 85% of the recycled plastics is coming from industry, whereas 15% comes from households. This situation strongly contrasts with the situation in Europe, where the majority of the recycled plastic waste originates from households due to official collecting schemes.

Demand: Côte d'Ivoire mainstream plastics manufacturers are keen to include recycled materials in their production as long as the material is the right quality and quantity and at a price which is competitive with virgin materials. They would turn to recycled materials if they could gain an economic advantage or improve their position with the end-buyers.

Supply. About 55 recycling firms are located in Abidjan. In addition, many of mainstream plastics manufacturers do in-house recycling. Recycling firms, the majority of which are small and medium size, manage to collect from large and easily accessible sources (hotels, restaurants, or supermarkets) or directly from firms where homogeneity and large volumes of plastic waste allow for an economically viable advantage. They have no means to collect household packaging. Also, they are constrained by landfill operations, which block access to plastic waste. Sorting is mainly done manually. Technology for mechanized scanning, sorting and traceability to ensure high quality standards is not yet used.



Circular Economy in Côte d'Ivoire

Demand and supply

On the basis of type, the recycled plastics market is comprised of (i) PET, (ii) HDPE, PP, PVC and (iii) LDPE. At present, HDPE and LDPE account for the majority of the recycling market share as it is used in the manufacturing of consumer and household goods such as furniture, shoes, bags and other such items. However, only 10 % of the 200,000 t produced plastics waste is recycled

Resins	Production Recycled material 2018 [p.a.]	Main waste stream in Côte d'Ivoire	Markets
Recycled PET	Up to 5,000 tones	Commercial: industry, hotels, restaurants	Export to Europe, (textile and automotive)
Recycled HDPE / PP / PVC	Up to 9,000 tones	Consumer / household	Domestic market (furniture, shoes, and household goods)
Recycled LDPE	Up to 6,000 tones	Consumer / household	Domestic market: bags and basins

The three main waste streams include (i) industrial/commercial (ii) household and (iii) municipality waste / depollution of the lagoon (dirty waste). While the industrial / commercial stream is clean and homogenous, household waste is a mixture of clean and soiled waste. The municipal and lagoon waste is mainly soiled. Only industrial stream waste can currently be used for recycling and reuse. Municipality and lagoon waste can mainly be used in construction applications (bricks).

Waste stream / source	State of waste	Treatment	Other possible treatment
Commercial	Clean, homogeny, identified	Recycling for new material	
Households / Municipality	Mix of clean and soiled	Mix of recycling and landfill	Constriction (houses and roads) and packaging
Lagoon waste	Majority of soiled material	Mix of recycling and landfill	Constriction: houses and roads

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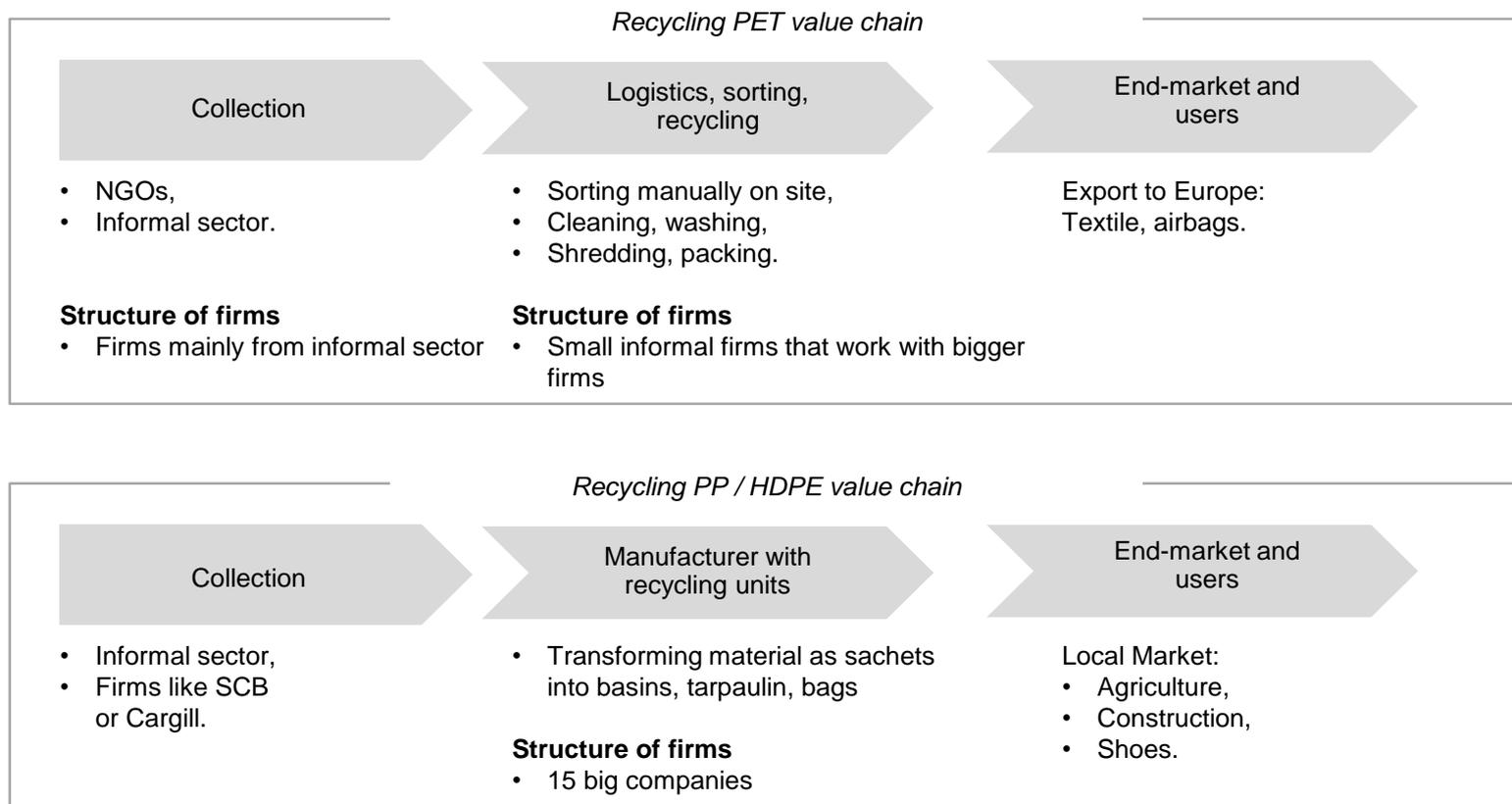
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Circular Economy in Côte d'Ivoire

Recycling value chains

Two main recycling value chains were identified: recycling PET and PP / HDPE value chain. Recycled PET is exclusively exported to Europe for textile and automotive applications. Recycled PP / HDPE are mainly produced by manufacturers with their own recycling units.



Circular Economy in Côte d'Ivoire

Recycling value chains: Collection



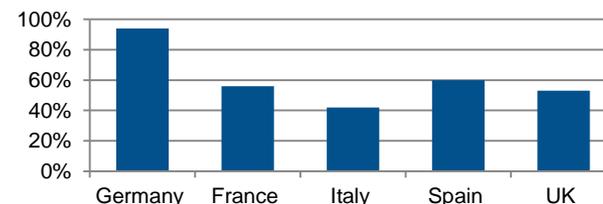
Collection of plastic waste in Côte d'Ivoire

- Industrial and household waste is mainly collected by NGOs, informal sector initiatives and important actors in agriculture (like SCB and Cargill),
- Many recycling companies collect mixed waste as well as recoverable plastics (for example Lassire déchets or Envipur),
- Several collectors (for example Sovadi or Europlast) also do sorting and crushing,
- Start-ups (such as COLIBA or RECYPLAST) are combining digital technologies with "waste picking" and collection activities to optimize the collection system and to source enough feedstock to recycle plastic products,
- Collection of agriculture plastic waste is well organized and coupled with recovery of material for production of basins for local markets (e. g. bags or tarpaulins). The system is driven by plastics producers with recycling units and long term contracts with agriculture producers,
- Role of informal sector: The informal sector collects significant amounts of plastic waste for recycling. Collected waste is also used by the sector itself for reuse (plastic bottles) and re-purpose (furniture, household). Such products are of low added-value and are mainly sold directly to consumer in the street.

Collection of plastic waste in Europe

- Some 31% of all the generated plastic waste is collected for recycling. The collection rate of generated plastic waste per origin is about 69% of household waste and 38% industrial waste,
- Germany collects more than 3,000,000 tons of plastic packaging. Italy, UK and France collect more than 2,000,000 tons,
- Landfilling and incineration (with or without energy recovery) remain the cheapest treatment method,
- Germany's ban on landfill is reflected in increasing recycling performance and on limiting of the leakage of plastic into the environment,
- Immature household waste management schemes (Poland) and non-harmonized collection schemes (UK) lead to lower recycling rates,
- Half of the plastic collected for recycling is exported to be treated in countries outside the EU. Previously, a significant share of the exported plastic waste was shipped to China. However, with the country's recent ban on plastic waste imports, it is increasingly urgent to find other solutions.

Estimated recycling rate
In % of total waste collected, 2018



Circular Economy in Côte d'Ivoire

Recycling value chains: Sorting and recycling



Sorting and recycling in Côte d'Ivoire

- Sorting is conducted manually, mainly by women on site. This step serves to remove labels, caps and collars,
- Cleaning and washing serves to eliminate food items residues, pulp fibers and adhesives. Only some of the recyclers in Côte d'Ivoire perform these activities due to lack of modern equipment,
- Recycling, if any, is mainly done internally on firm level. Many mainstream plastic manufacturers sort and recycle their sprues, scrap, etc. and return it to the manufacturing process,
- Recovery practice in Côte d'Ivoire does not include incineration (with or without energy recovery) which is common practice in Europe. However, it is also one of the major barriers for recycling (loss of resources).

Sorting and recycling in Europe

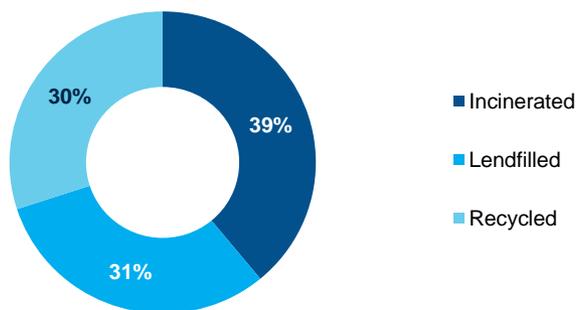
In Europe, energy recovery is the most common way to dispose of plastic waste, followed by landfill.

About 42% of plastic waste was recycled in the EU in 2016. Only, Lithuania (74%), Cyprus (64%) and Slovenia (62%) recycled more than 60%. With only 24.6% of its plastic waste recycled, Estonia came in last in the ranking. Finland (25.4%) and France (25.8%) and Estonia (24,6%) completed the bottom three.

A deposit-based scheme in Germany leads to almost 100% collection rates for PET bottles. This is reached by a sophisticated “pant” return system, where buyers have to pay a 10 – 30 Cent pant for each bottle, but get reimbursed when returning to any collection station. The deposit schemes for PET are the most efficient collection method, both in terms of quality and quantity. Norway has a similar system in place.

EU member states plastics waste treatment

2017



Collection Schemes and performance in selected EU countries

Country	Type of collection scheme	Collection Rate	Recycling Rate
Germany	Deposit scheme for PET bottles and yellow bins for all other, separation by color	76%	36%
Italy	A good level of separate collection in place	55%	42%
Spain	Separate collection scheme in place but high amount of plastic waste collected from residual waste	41%	31%
France	Separate collection on household bottles, and extension to all packaging	44%	21%
UK	Significantly non collected amount of household	38%	22%

Circular Economy in Côte d'Ivoire

Recycling value chains: End-market and users



End market and users in Côte d'Ivoire

End market in Côte d'Ivoire is still at an embryonic stage, but related demand continuously rising. Currently around 20,000 tons of plastics wastes are recycled and returned to the market.

Well established firms, like Sovadi or Europlast, but also innovative start-ups, like RECYPLAST, providing recyclates for the domestic market.

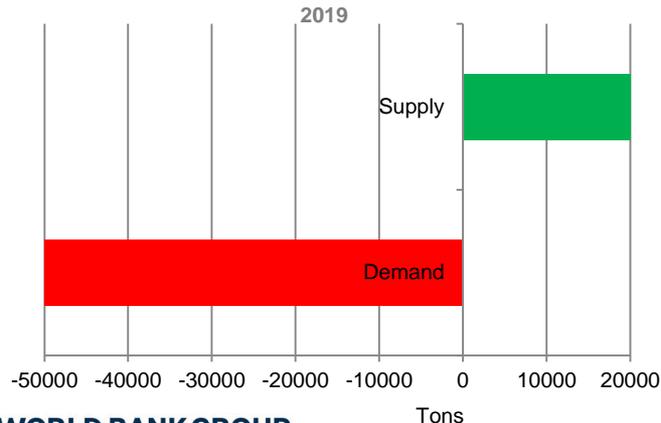
Access to recycled plastics waste is still limited in Côte d'Ivoire, since the demand is higher than the supply.

- Agriculture: some applications are in place for bags and buckets of collection and conveying of fruits and vegetables,
- Household: mainly intended for outdoor use,
- Shoes: Shoes often contain a certain amount of recycled content (up to 20 % content).

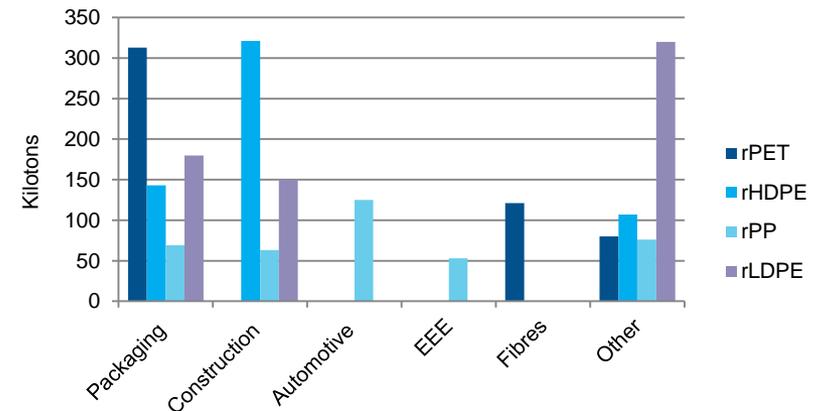
End market and users in Europe

- Packaging: bottle-to-bottle applications for clear and transparent PET and production of sheets used in the transformation process,
- Construction: mainly for production of pipes, insulation or carpets,
- Automotive: mainly for bumpers and hidden parts,
- Electronics industry: mainly for dark products, irons, printers, fans,
- Fibers are one of the primary end markets for non-woven interlining fabric (chemical suits, protection overalls),
- Small markets exist for furniture and consumer goods (hangers, boxes, clothes),
- Resins used for technical applications (HDPE, PP) show higher recycling rates as well as very pure waste inputs (PET from deposit schemes allow for higher penetration).

Supply and demand for plastics recycling in Côte d'Ivoire



EU Sectoral demand per recyclates 2016



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Circular Economy in Côte d'Ivoire

Prevailing constraints

There is low utilization of plastic waste in Côte d'Ivoire and less than 10% of plastic waste is entering the recycling value chain. In Europe, about 31% of plastic waste is recycled. There are several differences between EU and Côte d'Ivoire plastic recycling value chains that shed light on a significant gap in the recycling rate.

- **Missing linkages along the value chain.** Côte d'Ivoire plastic value chains are shorter than in Europe. Collectors, recyclers and manufacturers act in isolation from one another with limited collaboration and information exchange. Related platforms are missing. Manufacturers are not always aware about the options and potentials of recycling material that can be produced locally. Recyclers are not aware of the needs of the manufacturers. At present, relationships along value chains are strictly guided by price considerations, which makes it much harder to bridge the gap between supply and demand. Domestic price for recyclates is around \$US 1,000 per ton and, thus, 20 % above European or US level. European plastic value chains include several actors, which do not exist in Côte d'Ivoire. These include municipalities, recycling associations, waste management associations, and waste plastic brokers that help bridge the gap between the supply and demand.
- **Regulations.** Specific regulations and support schemes in Europe are going beyond awareness-raising. They are laying down rules to help establish a functional market for recycled material. This includes, among others, extended producer responsibilities (EPR), deposit refund schemes (collection and recycling rates over 85%), voluntary agreements, and regulatory framework at EU and member states levels. As far as Côte d'Ivoire is concerned, a tripartite agreement was signed between the Authority for Disarmament, Demobilization and Reintegration (ADDR), the municipalities of Yopougon, Attécoubé, Abobo, and industrial producers. The purpose is to operationalize a system for the collection, purchase and recycling of plastic waste. Although this is a positive example of circular approaches, low institutional capacities constrain its implementation.
- **Technology.** Recycling of mixed plastic waste requires advanced technology. Côte d'Ivoire recycling firms are constrained in particular by lack sorting capacities, inefficient separation technologies (still made by hand) and advanced recycling methods (such as pyrolyze). Their counterparts in Europe, in contrast, can benefit from a wide range of high-tech optical automation and sorting systems resulting in a better identification of contaminants, decontamination of plastic waste as well as feasible options that guarantee safety for food packaging applications of the recycled material.

European framework to improve recycling of plastic waste

European framework	Actions help to increase recycling
Specific regulations for action plan for the Circular Economy	<ul style="list-style-type: none"> • EU-wide target for plastic packaging recycling rate of 55% by 2025 and 100% by 2030, • Support actions for eco-design, • Quality Standards for recycling, • Actions to facilitate cross-border trade in recycling plastic, • Some of member states ban the landfilling of plastic waste. Waste which is not recycled is incinerated.
Regulation targets separate waste streams that affect plastics	<ul style="list-style-type: none"> • Waste framework directive, • Municipality solid waste (MSW), Construction and demolition waste, waste shipment regulations, • Bans or limitations on the landfilling of organic/combustible waste.

Circular Economy in Côte d'Ivoire

Challenges and barriers for upscaling

In general, barriers can be associated with around three main areas, namely coordination/organization, regulatory, and market barriers. Discussions with stakeholders pointed out that weak coordination and collaboration along the plastic value chains, coupled with simple recycling technologies hamper further upscaling of the recycling sector.

Both barriers have to be lifted dramatically in order to increase the use of recycled plastic inputs. Better coordination between the private and public sectors will facilitate better regulation. Better collaboration along the value chain will de-risk investments in recycling technologies and the adjustment of manufacturing technologies of plastics manufacturers.

Type	Constraints and barriers	Opportunities
Organizational	<ul style="list-style-type: none"> • Very limited communication between recycling firms and plastics manufacturers, • Weak coordination between public and private plastics sector stakeholders, • Intermediaries that can bridge the gap between demand and supply are only now emerging, • Absence of voluntary agreements and collections schemes. 	<ul style="list-style-type: none"> • 'Think tank' with key stakeholders: governmental officials, mainstream plastics manufacturers, recycling start-ups and multinationals to put in place an action plan for producing better recycling material in a more efficient way in Côte d'Ivoire, • Set up pilot model regions / testbeds involving municipalities to host plastic wastes collection with the involvement of a Corporate Alliance, • Community-driven strategy for social communication to advocate for "eco-awareness".
Regulation and support scheme	<ul style="list-style-type: none"> • Unclear plastic bag ban and uncertainty on the next product that might be banned, • Absence of quality infrastructure (standards, accredited laboratories, certification), • Absent of research, innovation incentives. 	<ul style="list-style-type: none"> • Public-private dialogue on sustainable plastics policy, which provides a clear roadmap on future taxation and regulatory mechanisms to assure predictable business environment, • Setting up a roadmap to enforce directives applicable to the plastic ban.
Technology	<ul style="list-style-type: none"> • Lack of advance technology (sorting and recycling) needed for dealing with more difficult waste treatments and for providing high quality recycled material, • Adaptation of local manufacturing processes to recycled raw material, • Low capacity of research institutions and workforce development institutions that might help to improve efficiency and technology. 	<ul style="list-style-type: none"> • Investments in digital / optical sorting, disinfection technology, washing and cleaning facilities, • Investments in plastics manufacturing processes – import replacement (virgin vs. recycling), • Investments in digital traceability systems across value chain, • Investment in integration of recycling material in products with eco-design.

Circular Economy in Côte d'Ivoire

Challenges and barriers for upscaling

Interviews conducted indicated that the Côte d'Ivoire mainstream plastics manufacturers are keen to include recycled materials in their production process as long as the material has the right quality, sufficient quantity is available and at the price of the recycled material is comparable to virgin raw material. Recycled plastic material can significantly serve as import substitution. It can also help to reach end-market requirements and has a positive impact on the environment.

The quality and steadiness of the supply is a key barrier in the use of recycled plastics. Uncertainty is high and prevents the recycling sector from scaling up. Some of the firms interviewed reported that uncertainty is too high for investments (either in modern recycling technologies or adjustment of manufacturing processes). Some firms announced that they are closing their recycling operations since it is not profitable. Valuable resources for the plastics sector continue to get lost in Côte d'Ivoire. Deterioration of the environment has reached critical levels, with proven negative impacts on ecosystems and potentially on human health. The competitiveness of the Côte d'Ivoire plastics sector is challenged by weak coordination of private and public action and the lack of advanced technology.

Type	Constraints and barriers	Opportunities
Competition	<ul style="list-style-type: none"> Increasing demand and limited availability of recycled plastics lead to high prices for such raw material, Comparably low quality and purity of recycled plastics as raw material limits the field of application mainly to low-price products (bags, buckets or outdoor furniture), High quality recycled plastics are mainly exported and are thus lost for domestic applications. 	<ul style="list-style-type: none"> The high readiness of mainstream plastics manufacturers to invest significantly in recycling facilities is a competitiveness advantage, There is an increasing interest in reducing dependency from global virgin plastics providers by making more use of recycled plastic content, Higher availability of recycled plastics with sufficient quality will lower the price for raw materials and positively impact the pricing of end products. It will also result in increased competitiveness of mainstream manufacturers, Previously, industry and policy makers agreed on limiting the ban policy if mainstream plastic manufacturers and end-users voluntarily agree to increased use of recycled content plastics.

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Sector Opportunities

Sectors with high growth opportunities

Opportunities

Challenges

Commercial



- Clean commercial plastic waste represents a well acknowledged source for plastics raw material,
- Low investments needed by mainstream plastics manufacturers in order to turn commercial plastic waste into value-added raw material,
- Commercial plastics waste is an appropriate and economically feasible alternative to virgin plastics,
- Sufficient technological experience exists how to re-use commercial plastic waste.

- Limited availability due to weak regional or national collection and sorting systems,
- Limited availability due to high export rates of recycled commercial plastics waste,
- Public-private dialogue and private sector driven initiatives are still at an embryonic stage for purposes of improving business conditions for re-use of commercial plastics waste.

Household / Municipality



- Modern recycling technologies available on the market can turn properly collected household waste into a valuable source of raw material,
- Domestic building and agriculture sectors are ready to use more recycled content plastics on a larger scale.

- Proper collection and sorting system is key,
- Recycled plastics made of household waste is still more expensive than virgin plastics,
- Quality of recycled plastics from household waste is often unclear and can not be properly certified by third parties. A national quality assurance and certification system is needed,
- Incentives for mainstream plastics manufacturers and end-users are missing.

Bioplastic



- Can significantly contribute to the lowering of negative environmental impact of plastics,
- Agriculture can become key application market for bioplastic (e. g. for mulching films or nursery bags),
- Multifunctional behavior of bioplastics makes it an attractive material for packaging and as a fertilizer,
- Increased environmental concerns increase pressure of manufacturers, end-users and policy to promote such material.

- Lack of awareness and understanding of benefits of bioplastics in consumer and industrial applications,
- End-users are not yet ready to pay higher price although ecological benefits are obvious,
- Limited number of CDI plastics manufacturers are willing and able to manufacture products made of bioplastic,
- Missing incentives for industrial use (e. g. in agriculture).

Commercial Waste

Overview

Commercial plastic waste represents a comparably clean type of waste which mainly consists of one polymer type such as PET or HDPE. It mainly originates from two streams. On one side plastics manufacturers that re-use their own plastic waste generated during the production process. The other stream comes from recycling firms and the informal sector that manage to collect commercial waste from large and easily accessible sources (hotels, restaurants, or supermarkets). They also collect it directly from firms with large volumes of homogeneous plastic waste. It represents This allows for an economically viable advantage.



Market size and growth

- Most plastic manufacturers re-use their own plastic waste generated during manufacturing. Since there is an average material loss of 10 % during manufacturing (sprues and scrap), the amount of internally re-used plastics waste is around 35,000 tons. This is based on 335,000 tons annual tons manufactured in Côte d'Ivoire. This kind of waste, due to its immediate re-use, never shows up in any statistics,
- About 5,000 tons commercial PET are collected by the informal sector or recycling firms.

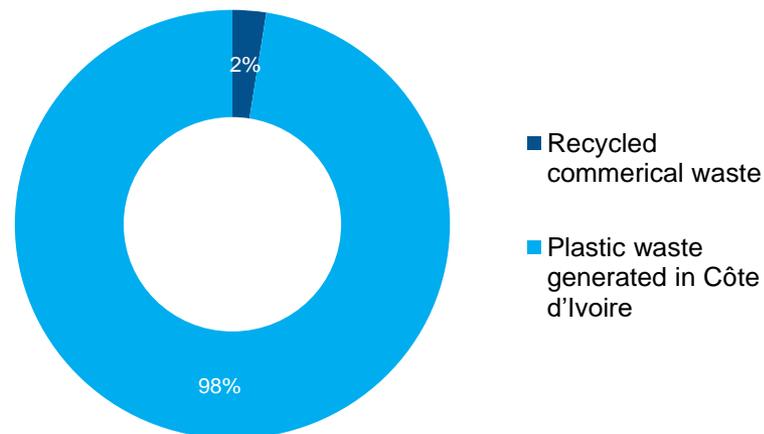
Sector structure

- PET, rHDPE, and rLPDE represents the main polymer types of commercial plastic waste, mainly originate from plastic bottles.

Sector trends:

- There is an increasing demand by plastics mainstream manufacturers to get access commercial waste,
- Efforts are spent to get access to clean and pre-selected commercial waste before it becomes mixed with household or other waste,
- Improvements in the collecting and pre-sorting system can boost the market for recycling commercial waste significantly.

Relevance of recycled commercial plastics waste in Côte d'Ivoire



Commercial Waste

Case study



Werner & Mertz is a European market leader for professional cleaning products. Its brands Erdal, Frosch and Tana are internationally acknowledged by consumers as well as by professional clients. Werner & Mertz was established in 1901 by selling Erdal shoe cleaning items. Currently, it has a broad product portfolio for consumer and professional applications. In the 1980s, Werner & Metz changed its firm strategy and focused on sustainable production. It focused on environmental production of cleaning supplies, but also on using packaging material with a minimum content of 80 % recycled raw material. All packaging material is made of PET. The firm employs 900 workers. Its capacity is 10,000 bottles per hour.

Challenge

- As part of its sustainability strategy, Werner & Mertz intended to substitute of over 80% of the PET raw material through recycled PET for bottle production without lowering the quality of the packaging material. An hourly capacity of 10,000 bottles had to be assured. This required excellent logistics as well as an assurance of sufficient recycled raw material. Furthermore, the original design should not change at all.

Solution

- The key challenge was not necessarily related to the manufacturing process as such but rather to the need to assure high purity and availability of the recycled raw material. For this purpose, Werner & Mertz cooperated the another firm Alpha: a recycling firm specialized in making bottles out of recycled PET (rPET). It was agreed to move Alpha on to the properties of Werner & Mertz to shorten the logistics and delivery time and in order to assure highest flexibility. Alpha was able to produce 60,000 tons of high quality rPET per year to supply Werner & Mertz and other clients,
- Currently, the packaging material consists of over 80 % of recycled material. However, the management of Werner & Mertz aims to increase the proportion up to 100% by 2020.

Diversification Strategy Werner & Mertz



Household / Municipality Waste Overview



Household waste represents the majority of origin of plastic waste in Côte d'Ivoire. It can be characterized by a mixture of both relatively clean plastic waste (mainly packaging and household plastics) and soiled waste (mainly organic and paper). The content of plastics is around 10 %, whereas PE, PP, HDPE, and LDPE are prevailing polymer types) on average for African countries. Several firms in Côte d'Ivoire are specialized in turning household waste into products. The closure of landfills in Côte d'Ivoire has significantly lowered the availability of such a waste stream.

Market size and growth

- As far as Côte d'Ivoire is concerned, 85% of the recycled plastic material is coming from industry, whereas 15% comes from households,
- About 9,000 tons of HDPE, PP and PVC as well as 6,000 tons LDPE have been recycled in 2018. The majority originates from household waste,
- Future growth depends on the market price for different polymer types as well as the maturity of the household collection system in Côte d'Ivoire.

Sector structure

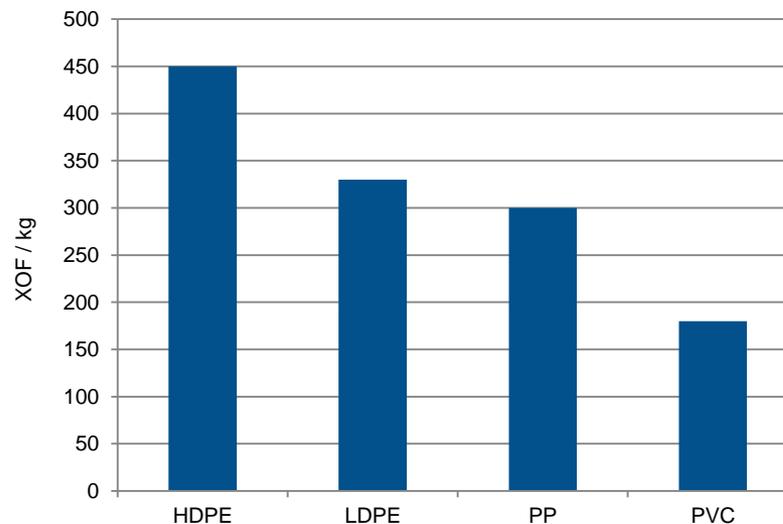
- HDPE, LDPE, PP and PVC represents the main polymer types, which are picked from household trash and used for recycling.

Sector trends:

- rHDPE and rLDPE are expected to become even more relevant due to an industrial shift from e. g. PVC to HDPE,
- Consequently, rPVC, mainly due to environmental reasons, is likely to lose importance,
- Improved collection and pre-sorting systems in Côte d'Ivoire combined with significant investments in modern recycling technologies will turn household waste into an important source for recycled plastics raw material.

Price for plastic waste according to polymer type

2019



Household / Municipality Waste

Case study



There is a huge demand in Côte d'Ivoire and ECOWAS region for construction houses and classrooms of schools. Recycled content plastic bricks have been proven to be an environmental friendly building material compared to other stone-based bricks (reduction of plastic waste, lower CO2 emission). CONCEPTOS PLASTICOS is a young Columbian firm specialized to produce such bricks of any kind of plastics waste, mainly coming from household and municipalities. In Côte d'Ivoire there is an ongoing UNICEF initiative intends to link the demand for better classroom facilities with the potential of turning especially lagoon plastics waste into commercial products.

Challenge

- What sounds easy in theory turns out as a challenge due to:
 - Lack of domestic production facilities,
 - Low readiness of government to investment in school infrastructure, like classrooms, sanitary equipment etc.,
 - Incomplete recycled content plastic supply chain (from waste material supply over bricks manufacturing until construction,
 - Reluctance of end-users to buy plastic-based building material.

Solution

- UNICEF catalytic funding,
- Partnering with CONCEPTOS PLASTICOS for completing domestic value chain for plastic bricks to assure competitive product development,
- Appointing women to collect and sell plastic waste,
- Supporting the setting up of a distribution channel,
- Negotiations with potential end-users,
- Construction of first classroom for 1,500 children,
- Next product generation under consideration (e.g. toilets, houses, clinics).

Diversification Strategy CONCEPTOS PLASTICOS



Products

Existing

New

Clients / Markets

Bioplastics

Overview



Bioplastics are bio-based, biodegradable, or both. Bioplastics are an important part of the circular economy. The term ‘*bio-based*’ means that the material or product is (totally or partly) derived from biomass (plants). For example, biomass used for bioplastics often stems from corn, sugarcane, cellulose or similar sources. *Biodegradable plastics* are produced from materials that can degrade after usage through aerobic composting or by anaerobic digestion.

Market size and growth

- The market size for bioplastics in Côte d’Ivoire is still embryonic and a self-sustaining market for bioplastics basically does not exist as such.
- High price for raw material, high complexity of manufacturing and lack of awareness about the potential benefits of bioplastics are key constraints.
- The current market for plastic products used in the agriculture sector in Côte d’Ivoire’s can be calculated to be around US\$ 42 million. If 10 % of this market would be substituted by biodegradable plastics within the next 3 years, the starting point is around US\$ 4 million.
- Market analyses have revealed that just for Cocoa and Coffee plants there is a demand for over 1 million nursery biodegradable bags per year (equivalent 50 tons p. a.).

Sector structure

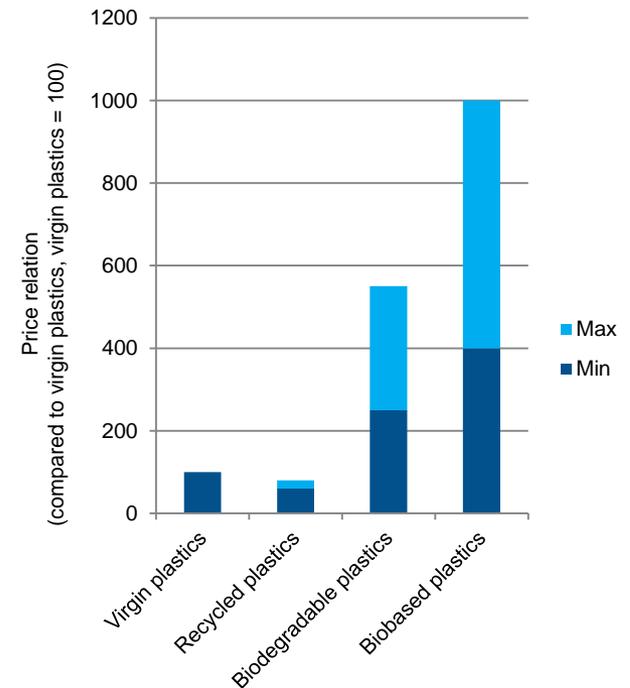
- The agriculture sector is a key sector for future applications of bioplastics.
- There is currently no commercial plastic product on the Ivorian market made of bioplastic. Efforts have been made by one of the biggest mainstream manufacturers but were discontinued due to lack of demand from end-users.
- Mulching films and nursery bags are key products for the agriculture sector. Still made of PET, these products will likely be among the first to be made on a commercial scale from bioplastics.

Sector trends:

- Competitors in neighboring countries have recently made significant investments in new lines for biodegradable packaging like bags for agriculture applications.
- Côte d’Ivoire bioplastics suppliers and potential end-users are poised to jointly develop prototypical applications for bioplastics.

Average price for selected plastics materials / blends

June 2019, European market price



Bioplastic

Case study



Over time the Fischer Group transformed itself from a workshop business to an internationally active medium-sized enterprise. The core business of the Fischer Group started with dowels and other repair systems based on Polyamide plastic material. Today, it offers fixing solutions for various sectors such as construction, automotive and automation. The characteristic feature of the company is its power of innovation and continuous transformation. This has repeatedly led not only to the development of new products, but also to the opening up of new areas of business. Fischer employs 5,200 employees worldwide and has a capacity of 152,000 tons p. a.

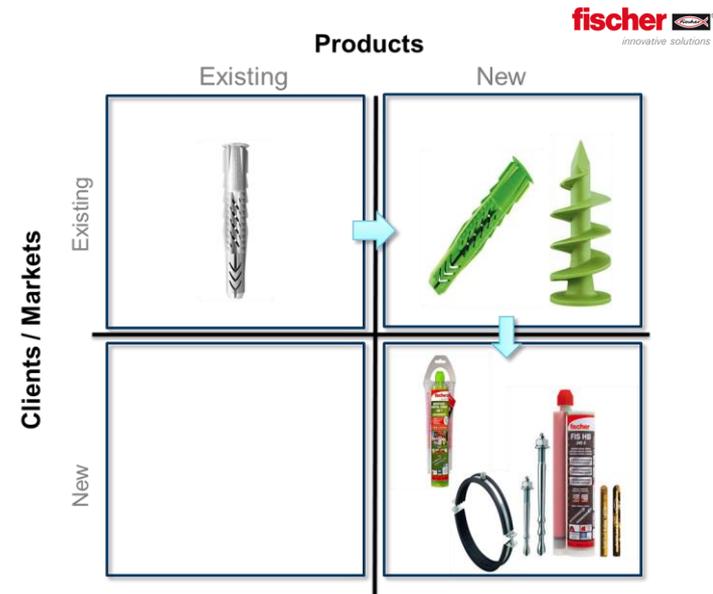
Challenge

- As part of the sustainability strategy, the Fischer Group decided in 2014 / 2015 to develop new products based of bio-based material. The targets were:
 - Same functional behavior as conventional products,
 - No competition to food-based products,
 - Bio-based products to be manufactured on the same manufacturing equipment like traditional products.

Solution

- As a result of the sustainability strategy, the UX GREEN 2012 was introduced as the world's first plastic anchor made of (bio-based) bioplastic. At the beginning of 2015, the Fischer Group introduced FIS GREEN 300 T, the world's first chemical injection mortar made of bioplastic. The firms is thus addressing fabricators and building owners who attach great importance to sustainability when it comes to building, renovating and fastening.
- At least 50% of all "greenline" products are produced from bio-based raw materials. The basis for the plastic components is castor oil, which is extracted from the seeds of the miracle tree. All products belong to the class "BIOBASED 50-85%".
- The biggest challenge was the availability of a sufficient amount of bio-based raw material. In 2010 / 2011 when the green dowel was developed, such material did not exist for industrial use.

Diversification Strategy fischer GmbH



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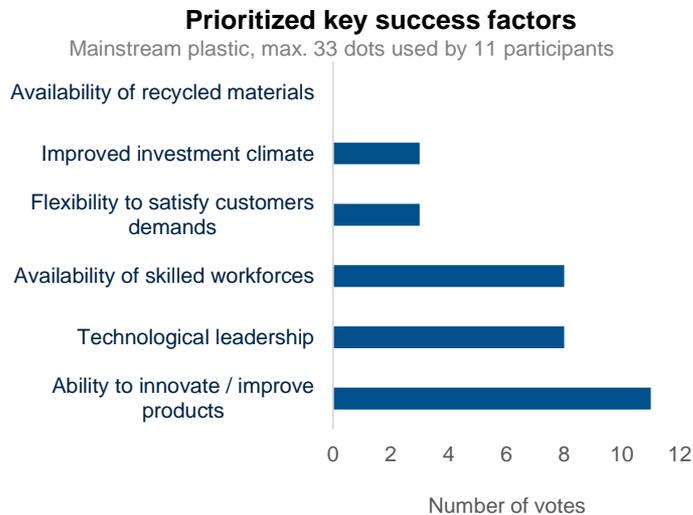
Strategic Decision-making Process

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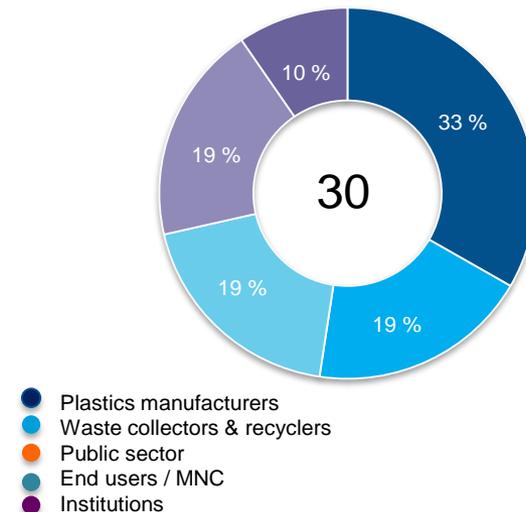
The chapter on Market Structure and Dynamics identified several high growth areas in the mainstream and circular plastics sector. A deeper involvement of the mainstream plastics industry was needed in order to commonly identify investment opportunities and related bottleneck the Plastic Sector Competitiveness Strategy shall target at.

Entrepreneurial Discovery Workshops (EDW) and Validation Workshops were held with the participation of more than 60 plastics sector stakeholders. The main objectives of the workshops were as follows:

- to validate the findings of the study on Market Structure and Dynamics,
- to identify and prioritize investment opportunities with high impact on industry, and,
- to identify competitiveness initiatives and collaborative actions needed to remove existing barriers and to bridge related gaps in order to expand existing segments and move toward a circular economy ecosystem in Côte d'Ivoire.



Industry engagement in participatory activities
In % by stakeholders' groups

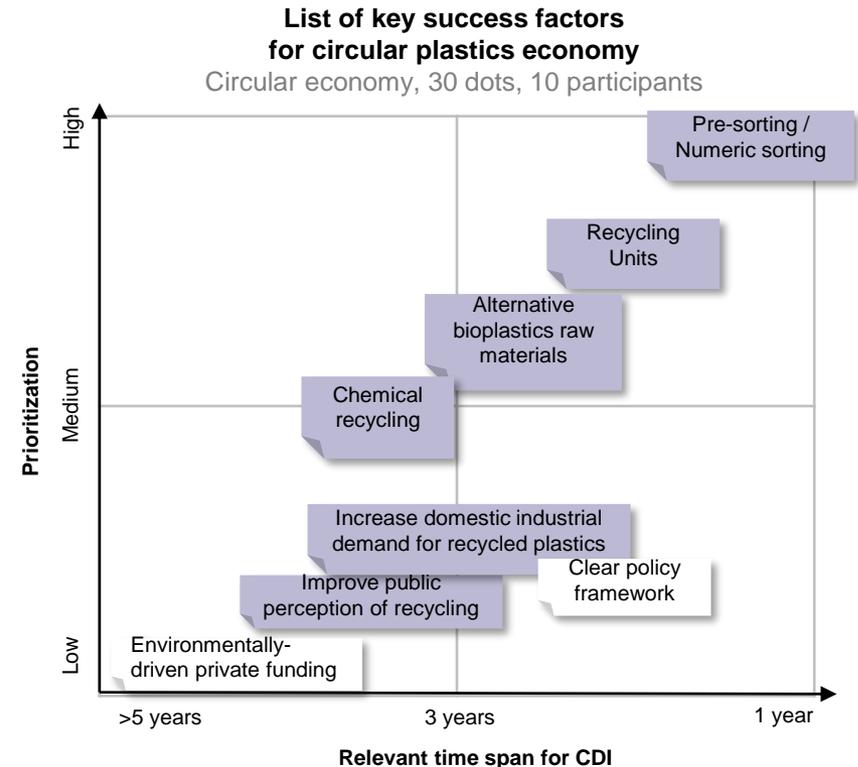
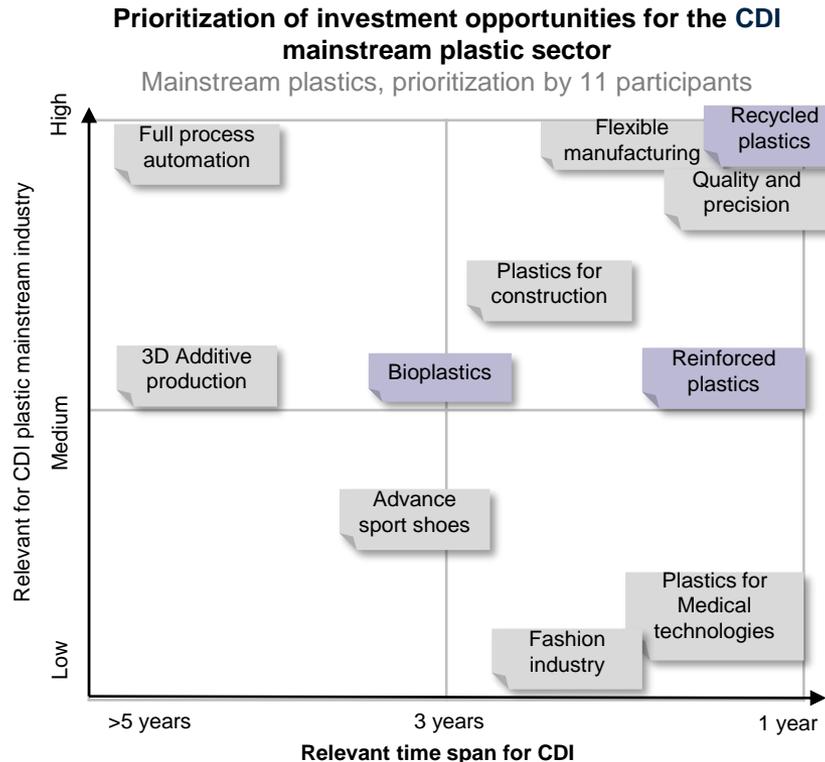


Strategic Decision-making Process

Prioritization of investment opportunities and related success factors

The participants of the EDW prioritized several investment opportunities based on the overall expected impact on Côte d'Ivoire's plastics manufacturing industry as well as on the timeframe in which these opportunities might become relevant in Côte d'Ivoire. Some of these investment opportunities target dedicated sectors like construction. Others are cross-cutting in nature such as flexible manufacturing, recycling or bioplastics.

A similar prioritization was done with experts of the circular plastics economy. Improvements in pre-sorting and collection of plastics waste, strengthening of recycling capacities as well as increased use of bioplastic raw material were identified as key success factors for a circular plastics economy. All findings reveal a high degree of complementarity.



- Opportunities in grey focus on mainstream plastic
- Opportunities / success factors in blue focus on plastics circularity

Source: Entrepreneurial Discovery Workshops, Discussions & Group works results

Strategic Decision-making Process

Investment opportunities

Four out of five investment opportunities are cross-cutting in character. This means that they target several plastics mainstream sub-sectors like construction, packaging and agriculture. Flexible manufacturing represents an approach that leads to higher efficiency and consequent reduction of manufacturing costs. Bioplastics (including bio-based plastics and / or biodegradable plastics) will become essential in the next five years. This is especially the case in the agricultural sectors. Recycled plastics will likely be introduced in all plastic mainstream sectors in Côte d'Ivoire.

Investment opportunities	Relevance and sector impact
Flexible manufacturing	<ul style="list-style-type: none"> • Relevant for more than 25 % of the whole mainstream plastics manufacturing industry in the short term, • Effective defense vis-à-vis overseas competition, • Reduction of manufacturing costs and help in responding to rapidly changing customer needs, • Increase in the product range and adaption to the new market trends, including biodegradability and recycling, • Preparation for full automation (Industry 4.0) which might become relevant within the next 5 years, • Targeted sub-sectors: construction, agriculture, packaging, household application and shoes.
Quality control	<ul style="list-style-type: none"> • Testing, certification and accreditation are major priorities for CDI, • Quality control is required to ensure correct properties and compliance with international standards, • In the face of the increasing use of recycled plastic raw materials, quality control is highly relevant to ensure the proper quality of the recycled raw materials, • Targeted sub-sectors: construction, agriculture, packaging, household application and shoes.
Construction sector	<ul style="list-style-type: none"> • Construction is being considered as a key driver for the Ivorian economy, • Currently, products like doors, windows or sanitary articles are still imported, • Targeted sub-sector: doors and windows, made of PVD as well as bricks and paving from recycled plastics
Reinforced material	<ul style="list-style-type: none"> • This area concerns a significant share of the plastics manufacturing industry, • The manufacturing of such material is still a challenge, • Key investments are needed in equipment upgrading (e. g. flexible manufacturing), • Targeted sub-sectors: construction, agriculture, and packaging.
Recycled plastics and bioplastics	<ul style="list-style-type: none"> • Relevant for up to 20% of the whole plastics manufacturing industry in the short term, • Recycled HDPE, LDPE and PET can serve as import substitution, • Major investments are needed in training, community awareness-raising, machinery and equipment as well as in an improved waste collection and cleaning system, • Targeted mainstream sub-sectors: construction, agriculture, packaging, household applications and shoes.

Strategic Decision-making Process

Strategic framework

The different investment opportunities and related barriers are incorporated into a **strategic framework** which illustrates the **three key plastics manufacturing sectors** with the highest growth potential:

- Construction,
- Agriculture,
- Packaging.

The strategic framework also points out that **process-related investments** at the firm level are of particularly high relevance in terms of supporting the competitiveness of all plastic manufacturing sub-sectors.

In particular:

- Flexible manufacturing,
- Quality control.

The increased relevance of the Circular Plastics Eco-System in Côte d'Ivoire argues for having better availability of **recycled plastics raw material** from which the Ivorian mainstream plastic manufacturers can significantly benefit. However, initiatives that lead to better sorting and pre-selection of plastics waste will be an important element of the Plastics Sector Competitiveness Strategy.

Since **bioplastics** play an increasing role in the Circular Plastics Eco-System in Côte d'Ivoire (especially in the agricultural sector), the strategic framework positions bioplastics as the second most important new raw material source following recycled plastics. Furthermore, policy reforms which lead to better business conditions are also considered to be part of the strategic framework.

The Competitiveness Initiatives proposed in the next chapter will closely follow the strategic framework and specifically target the existing barriers and gaps that hamper the Ivorian plastics industry in its efforts to expand existing segments and to move to a circular economy ecosystem in Côte d'Ivoire.

Strategic Decision-making Process

Strategic framework

Strategic framework		Circular Plastics Eco-System		
		MAINSTREAM PLASTICS	RECYCLED PLASTICS	BIOPLASTICS
Product	 CONSTRUCTION			
	High potential <ul style="list-style-type: none"> • Windows and doors, • Sanitary ware. 	High potential <ul style="list-style-type: none"> • Bricks, • Paving. 		
	 AGRICULTURE INPUTS			
	High potential <ul style="list-style-type: none"> • Irrigation systems. 	High potential <ul style="list-style-type: none"> • Buckets, • Greenhouse films. 	High potential <ul style="list-style-type: none"> • Soil covering films, • Nursery films, • Conveyance of fruits / crops. 	
Product	 PACKAGING			
	High potential <ul style="list-style-type: none"> • Flexible packaging solutions. 	High potential <ul style="list-style-type: none"> • Bottles. 	High potential <ul style="list-style-type: none"> • Conveyance of fruits / crops. 	
Process	 FLEXIBLE MANUFACTURING			
	<ul style="list-style-type: none"> • Increase competitiveness of existing products and manufacturing processes, • Enable entry into new, high-growth products. 	<ul style="list-style-type: none"> • Integrate recycled raw material into manufacturing processes. 	<ul style="list-style-type: none"> • Integrate bio-related raw material into manufacturing processes. 	
Process	 QUALITY CONTROL SYSTEM			
	<ul style="list-style-type: none"> • Existing and new products, • Firm-level support interventions (quality and productivity). <hr/> <ul style="list-style-type: none"> • Sectoral interventions (e. g. workforce development, standardization, etc.). 	<ul style="list-style-type: none"> • Sorting of plastic waste, • Firm-level interventions (quality control and productivity). <hr/> <ul style="list-style-type: none"> • Public/municipal level interventions to improve quality of collecting/sorting system, • Public-private initiatives. 	<ul style="list-style-type: none"> • Integrate bio-related raw material into manufacturing processes. 	
Policy	 SECTOR POLICY			
Policy	<ul style="list-style-type: none"> • Ensure policy stability and predictability. 	<ul style="list-style-type: none"> • Support sufficient recycled raw material supply. 	<ul style="list-style-type: none"> • Stimulate increased use of bio-based and biodegradable products. 	

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Vision

The plastics sector is important to the Côte d'Ivoire economy. It provides over 20,000 jobs, and has an annual turnover of US\$ 500 Million, whereas a significant part comes from exports to the ECOWAS countries. The sector is leading industrial transformation to a more circular economy where high value-added products, increased use of recycled plastics, biodegradable and bio-based alternatives propel growth, help protect the environment and improve the well-being of citizens. The government has set the ambitious target of creating 150,000 new jobs in the plastics sector, including recycling activities.

VISION

The Côte d'Ivoire plastics sector is an ECOWAS market leader in value-added sustainable plastics with a well-functioning circular ecosystem

Côte d'Ivoire becomes a place where higher value-added plastic products are produced by modern manufacturing technologies and where manufacturers increasingly use recycled and bio-based materials. It is also a place where the government promotes the circular economy by using a combination of incentive measures and regulation. In Côte d'Ivoire, industry, citizens and government work together to create jobs and decrease dependence on imported fossil-based products.

The plastics manufacturing sector in Côte d'Ivoire produces high value-added products for fast-growing sectors like construction, building, packaging, and agriculture. By 2023, the mainstream plastics sector will export 40% of new products to ECOWAS. The introduction of advanced manufacturing practice enables diversification and use of recycled material in all key applications and promotes the use of bio-based material.

Substantially improved collection, separation, and recycling capacity assure sustainable availability of recycled materials for production. By 2023, recycled material will become an important source for sectors like building and construction. Biodegradable solutions and bio-based alternative feedstocks for plastics manufacturing are developed for agriculture and food industry applications. By 2023 many bioplastic applications will be state of the art.

Plastics applications in agriculture and construction sectors are far more integrated. These sectors work closely with plastics recyclers, bioplastics material providers, and government agencies to protect the environment.

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Competitiveness Initiatives Structure

Strategic Objective 1:

Diversification towards higher value-added and sustainable plastics products

Competitiveness Initiative 1 Initiating new and sustainable product applications for high growth areas

Objectives:

- Diversification by new products for high growth markets,
- Strengthening domestic supply chains by linking mainstream plastics manufacturers to end-users from high growth markets,
- Substituting mainstream plastics by recycled or bioplastic for sustainable products.

Support interventions

- Defining the business opportunities: market analysis; benchmarking costs,
- Investment match-making,
- Supporting market access.



FIRM LEVEL INVESTMENTS

Strategic Objective 2:

Modern manufacturing technologies to facilitate new plastics-based solutions

Competitiveness Initiative 2 Towards advanced plastics manufacturing

Objectives:

- Improving competitiveness of plastics manufacturers by advanced efficiency, flexibility and quality of plastic manufacturing processes.
- New and sustainable high-growth plastic products based on enhanced manufacturing processes.

Support interventions

- Assessing technology fit,
- Process re-engineering support.
- Skills support.



Strategic Objective 3:

Improving the economics for plastics recycling

Competitiveness Initiative 3 Improving capacities for plastics recycling

Objectives:

- Increasing industrial capacities for recycling,
- Using more recycled content plastics,
- Reduction of price for recycled plastic.

Support interventions

- Supporting supply stability,
- Assessing technology fit.



PUBLIC / PRIVATE

Competitiveness Initiative 4 Association Ivoirienne pour la Valorisation des Plastiques (AIVP)

Objectives

- Enable a plastic waste collection system,
- Connect waste management, recycling, manufacturing and markets.
- Implement demonstration projects on municipal waste collections.

Support interventions

- Advocacy,
- Running awareness campaigns,
- Mobilizing public support,
- Market linkage.



POLICY

Competitiveness Initiative 5 Policy reforms for circular plastics economy

Objectives

- Establishment of private public dialog on regulatory issues,
- Setting-up national plastics policy,
- Market development for green plastics,
- Adopt standardization.

Support measures

- Promote predictability of policies,
- Addressing externalities,
- Technical advisory support,
- Public-private consultation.



Competitiveness Initiatives

Approach

Competitiveness initiatives have substantial private sector investments at their core. Their implementation must include collaborative actions which are necessary for effective development of a circular economy through de-risking private sector investments. Effective market development includes a set of market and regulatory measures.

The strategic framework identifies investment options along the value chains and allows for the identification of lead roles. While the private sector is specifically responsible for firm level investment, the public sector is positioned to promote public/private dialog and must remain responsible for public reforms. The goal is to support the competitiveness of mainstream plastics manufacturers but also to enable the formation of a dynamic market conducive to a circular plastics economy.

	Roles	Material supply chain	Design and Manufacturing	Distribution and Use	Dispose / end of life
CI 1: Initiating new and sustainable product applications for high growth areas.	Private	●		●	
CI 2: Towards advanced plastics manufacturing.	Private		●		
CI 3: Improving capacities for plastics recycling.	Private	●		●	
CI 4: AIVP	Private Public	●	●	●	●
CI 5: Policy reforms for circular plastics economy.	Public	●		●	●

Competitiveness Initiatives

Initiative Matrix

Private sector investments are at the core of competitiveness initiatives. Their implementation in the plastics manufacturing sector involves collaborative actions which are intended to improve competitiveness of the sector through product diversification. The targeting of high grow areas such as plastics for permanent construction purposes must serve to advance the effective development of a circular economy through the reduction of single use plastics. Effective sector development includes measures for de-risking private sector investments through a set of market and regulatory measures.

	Awareness & Training	Facilitation	Technical Support on Gaps	Investments / deal making	Objectives	Target	Demand Investments
CI 1: Initiating new and sustainable product applications for high growth areas.			●	●	New products for building, construction and agriculture sector Recycled, bioplastic inputs for manufacturing	Mainstream plastics manufacturers	US\$ 30 - 40 Mio.
CI 2: Towards advanced plastics manufacturing.			●	●	Existing product portfolio	Mainstream plastic manufacturers	US\$ 15 - 20 Mio.
CI 3: Improving capacities for plastics recycling.			●	●	Mainstream plastics manufacturers, Recycling firms	Supplier, recyclers	US\$ 15 – 20 Mio.
CI 4: AIVP	●	●	●		Circular plastics economy	Plastics supply chain	US\$ 0,2 – 0,4 Mio. p.a.
CI 5: Policy reforms for circular plastics economy.		●	●		Circular plastics economy	Suppliers and end-users	US\$ 1 – 3 Mio. p. a.

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Competitiveness Initiative 1

Initiating New and Sustainable Product Applications for High Growth Areas

Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Rational

In Côte d'Ivoire, there are still plastic subsectors with untapped high growth potential. The building & construction, packaging and agricultural sectors offer high growth opportunities for mainstream plastics but, also recycled content plastics. Examples are:

- Frames and doors (mainstream plastics),
- Bricks and household paving (recycled content plastics), or
- Mulching films or nursery bags (bioplastics).

To enter such markets and capture high growth opportunities, mainstream plastics manufacturers have to move from their current product spectrum towards new and sustainable products. This goes hand in hand with the need of more modern manufacturing technologies and equipment. Additionally, non-technical activities are needed to link mainstream plastics manufacturers with new markets for better supply chain development.

Goals

To stimulate private investments aiming at:

- Diversification of existing product portfolios by developing / manufacturing higher value added products (new and / or sustainable ones) for high growth markets,
- Substituting (partly or fully) mainstream plastics by recycled or bioplastic for sustainable products,
- Strengthening domestic supply chains by linking mainstream plastics manufacturers to end-users from high growth markets.

Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Issues addressed

The Côte d'Ivoire plastics manufacturing industry is exposed to increased global competition and foreign competitors entering the domestic market. At the same time, several high growth market opportunities exist which are not yet covered by the Ivorian plastics manufacturers. Many Ivorian end-users still have to import such products rather than to access local supplies.

Moving to higher value-added products, especially in high-growth markets, is a promising strategy to keep the entire sector competitive. However, there are two prevailing constraints to be addressed:

- Lack of technological capacities to extend the plastics product portfolio towards high growth markets,
- Lack of access to high growth markets, incl. communication and cooperation between mainstream plastics manufacturers and end-users from respective sectors.

Both constraints also hamper the increased use of recycled content plastics and bioplastic to combat the ongoing pollution of the environment. Especially biodegradable plastics for agriculture and recycled content plastics for the building & construction market will help these sectors to become more environmentally friendly. Previous market analytics clearly indicated that there is a growing market for such sustainable products.

Target Group

Mainstream plastics manufacturers ready to invest in product diversification or substitution of mainstream plastics.

Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Actions implemented within the Competitiveness Initiative

- Preparation of investments:
 - Awareness raising to motivate mainstream plastic manufacturers to consider investments for product diversification,
 - Market assessment to understand targeted new markets,
 - Technical feasibility studies to estimate technical risks connected with investments in new and sustainable products,
 - Technical expert advice to identify critical success factors,
 - Support to prepare bankable loans and investment plans to ease access to finance,
 - Connecting groups of firms along the supply chain to prepare joint investments.
- Facilitation of investments:
 - Facilitation of access to finance,
 - Moderation of negotiations with banks / investors / deal making.
- Post-investment activities:
 - Support market access and commercialization activities,
 - Matching plastics manufacturers with end-users from high-growth areas,
 - Workforce development.

Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Success factors for implementation

- Facilitation of access to finance,
- Tailor-made, professional support activities,
- Mobilization of broad spectrum of beneficiaries, and
- Promotion of business driven investments instead of technology driven investments.

Expected impact

- Above-average growth rates of beneficiaries,
- Increased product spectrum of locally manufactured plastics products,
- Reduced import of plastics products,
- Increased technological competence and increased use of modern plastics manufacturing technologies, and
- Increased market share of recycled content and bioplastics.

Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Business Case 1: Frames and doors for building applications

Market drivers:

- The housing need in Côte d'Ivoire is estimated at 400,000 to 600,000 units, with a yearly increase of 50,000,
- Windows made of plastic are affordable, sustainable and provide long term functional performance. Consequently, plastic window frames have become an alternative to wooden or aluminium-based frames,
- Interviews with architects confirmed that there is an increasing demand for beautiful design, which can be easily achieved with plastic doors and windows,
- Ivorian consumers often like to copy their neighbors. If plastic doors and windows were to be adopted by some, the demand could increase every year that companies offer PVC windows and doors at architectural and building fairs,
- Key success factors for using plastic frames and doors are quality, durability, price and aesthetics,
- Windows frames and doors are manufactured by extrusion (single-screw extruder for processing) using PVC as plastic material. From the manufacturing point of view, the technical risk is comparably low, since PVC extrusion is relatively easy to handle.



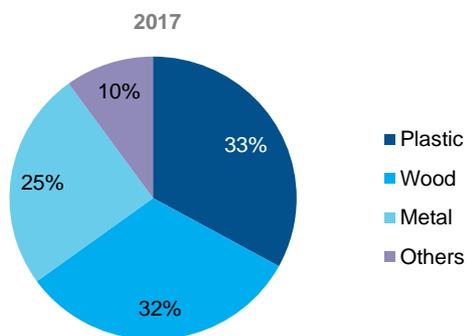
Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Business Case 1: Frames and doors for building applications

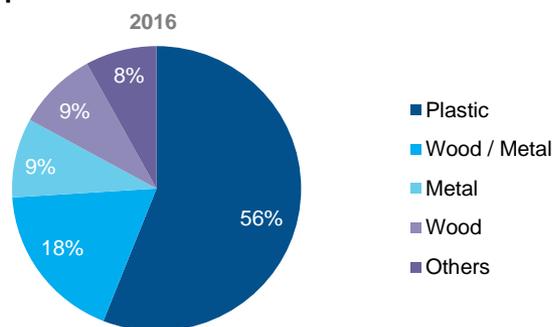
Market estimation (by 3 years period):

- Cote d'Ivoire has a program to build 50,000 houses for five years. Approximately 10,000 are actually built each year (including all levels: from simple to residential housing), most of them social houses (around 90 %),
- So far, plastic doors and windows are all imported, whereas the amount of imported products quadrupled from 2017 to 2018,
- A typical house in Cote d'Ivoire has about 10 windows and 2 exterior doors. Thus, the domestic market for window frames and doors can be estimated to be around **US\$ 25 Million** per year (for all kinds of doors / frames). This can be even higher due to increasing renovation activities,
- Taking into account that plastic doors and window frames usually have a market share of one-third of the entire market, the potential for plastic doors and window frame is around **US\$ 8 - 10 Million**,
- Other neighboring countries have similarly ambitious national housing programs (e. g. Niger: 40,000 houses p. a., Ghana: 50,000 houses p. a. or Burkina Faso: 40,000 houses). This increases the potential ECOWAS market for Cote d'Ivoire plastics manufacturers to up to **US\$ 40 Million** annually.

World market doors

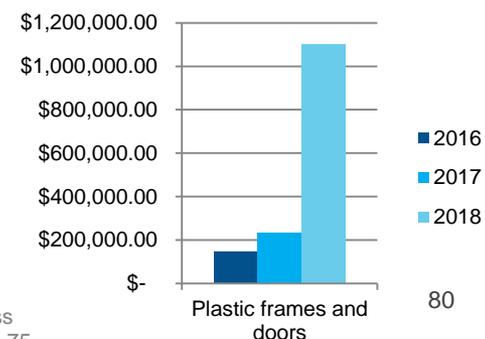


European window frames market



Development of imported plastic window frames and doors

Côte d'Ivoire, 2016 - 2018



Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Business Case 1: Frames and doors for building applications

Examples of investments needed to set up a manufacturing line for PVC window frames.

Assumption: In-house extrusion, sale of extruded semi-finished products to external fitters who assemble windows at their cost and risk.

Technical risk: **Low**

- Since the key manufacturing process itself remains unchanged, the technical risk can be considered to be low.

Economical risk: **Low**

- Moderate investments for tools, machine parts and peripheral technology.

Devices / item	Investment*
Extrusion line (single-screw extruder for processing PVC)	Available
Profile tool	US\$ 20,000
Cooling section	US\$ 15,000
Calibration unit	US\$ 15,000
Caterpillar puller	US\$ 8,000
Cutting and stacking device	US\$ 5,000
Miscellaneous	US\$ 2,000
Launching costs; ramp-up phase	US\$ 10,000
Material storage, drying, conveying	Available
Sum	US\$ 75,000

Typical investment: US\$ 75,000 – 110,000.

Return on investment: < 3 years, based on standard depreciation.

Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Business Case 2: Bricks and household paving made of recycled plastic

Market Drivers

- The housing need in Côte d'Ivoire is estimated at 400,000 to 600,000 units, with a yearly increase of 50,000. However, the actual figures may be lower currently at around 10,000 houses per year,
- The national program provides exemptions from material taxes for construction in social housing. To benefit from tax exemptions, companies must have a split of 60% / 40% social housing/market rate in their construction program,
- Social and low-cost houses are of major concern and can be considered as primary targets for recycled plastic bricks,
- Neighboring countries have similarly ambitious housing programs in place,
- Plastic-based bricks and household paving are very affordable building material. Manufacturing bricks and paving made of soiled plastics waste has been “state-of-the-art” for many years but has recently received increasing interest,
- Manufacturing of recycled plastic bricks is comparably easy and has welcomed new players,
- Recycled plastic bricks are, on average, 30% cheaper compared to those made with traditional building techniques,
- Donor-funded initiatives currently support the use of recycled content plastic bricks and household paving for building purposes in order to promote further domestic demand,
- Increased concerns about plastic pollution and ongoing initiatives to promote the use of recycled-content plastic products will be an additional driver for plastic bricks and household paving for building and construction purposes,



Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Business Case 2: Bricks and household paving made of recycled plastic

Market estimation (by 3 years period)

- 90% of the houses built within the national program are intended for poorer citizens, for whom affordable building material is of high relevance. Thus, the potential market for recycled plastic bricks is about 35,000 houses,
- Plastic-based bricks can be used for both low-rise and multi-level houses, using appropriate construction techniques,
- Given the case that around 3,750 bricks are needed for a 60 square meter house and each brick is about US\$ 1,5, the material costs for recycled plastic bricks are US\$ 5,625 per house. The entire price for a social house with 2 – 3 rooms is about US\$ 20,000,
- Given the case that about 10,000 social houses are built in Cote d'Ivoire each year and the market share of bricks made of recycled plastic can be calculated by 10 %, domestic market for recycled plastic bricks is around **US\$ 6 Million**. p.a. Other initiatives, like school building programs might increase the market potential further up to **US\$ 10 Million**,
- Neighboring countries have similar ambitious housing programs in place, but transport and logistics costs are comparable high,
- The market for household paving is quite difficult to estimate, but it is likely much less than for recycled bricks.

Competitiveness Initiative 1: Investments in new and sustainable product applications for high growth areas

Business Case 2: Bricks and household paving made of recycled plastic

Examples for investments needed to set up a manufacturing line for recycled plastic bricks

Technical risk: **Low**

- Easy-to-handle manufacturing process. Even older extrusion machines can be used, which are more robust against the impurity of the recycled content raw material.

Economical risk: **Low**

- Moderate investments for tools, machine parts and peripheral technology.

Devices / items	Investments*
Extruder device	Available
Thermopressing device	US\$ 25,000
Thermopressing molds	US\$ 3,000
Additional spare parts for adaptation of existing extrusion process	US\$ 12,000
Sum	US\$ 40.000

Typical investments: US\$ 30,000 – 60,000.

Return on investment: < 2 years, based on standard depreciation.



Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

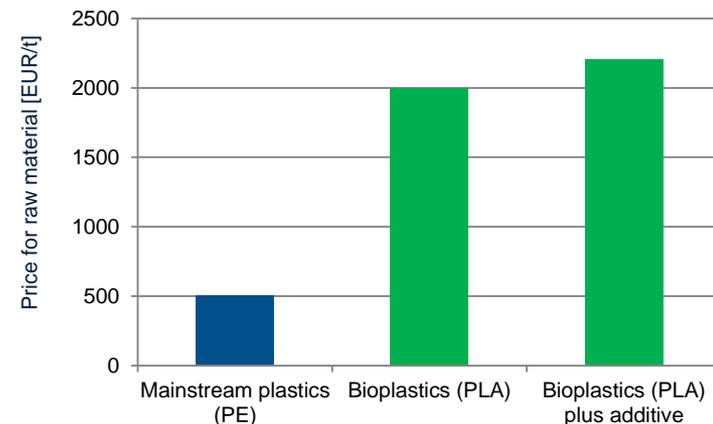
Business Case 3: Mulching films and nursery bags made of bioplastics

Market Driver

- The National Development Plan 2016 to 2020 for Côte d'Ivoire foresees a total of US\$ 2,6 billion for investments in the agriculture sector. Moreover, agriculture represents 17.4% of the country's GDP and accounts for 60% of its exports.
- The continuous high demand agricultural films, nets and bags, is likely to increase due to the expected level of productivity. Mulching films, in particular, can increase productivity for many vegetables and other agricultural products.
- Future requirements for organic production will force agriculture firms to purchase more and more biodegradable material.
- Lack of linkages between mainstream plastics manufacturers and agriculture firms as well as high price for bioplastics raw material are the key barriers.
- Competitors in neighboring countries are also starting to produce biodegradable films for agricultural applications. This can increase pressure and opportunity for Ivorian manufacturers.

Comparison of raw materials for mulching films

European market prices, June 2019



Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Business Case 3: Mulching films and nursery bags made of bioplastics

Market estimation (by 3 years period)

- The current African market for agricultural films can be calculated to be 8% of the global market, valued at **US\$ 320 Million**. The African agricultural films market is expected to grow 5% over the period 2017-2022,
- The domestic market for plastic nursery and ripening bags as well as for mulching films is huge, but fragmented. Thus, there are no streamlined data available. However, firm level interviews confirmed a growing demand.
 - Cote d'Ivoire produces 400,000 tons bananas, of which 300,000 tons are intended for the European market. After harvesting, ripening bags are needed for transportation. The biggest manufacturers of bananas in Cote d'Ivoire (e. g. SCB) have an annual forecast of 80,000,000 ripening bags and protection sleeves per year. Each bag can be estimated with 0,03 – 0,05 US\$ (non-biodegradable PE), resulting in a market segment of **US\$ 2,5 – 4 Million**,
 - In the case of pineapples, 100,000,000 bags per year are used. Each bag is just 3 g. All this results in **300 tons** for plastic ripening bags for pineapples. The price for 1 ton of such bags is around US\$ 3,200 resulting in a market of **US\$ 1 Million**,
 - In order to assure organic pineapple production, mulching films have to be biodegradable. The current demand is forecast with 50,000 mulching units per year (equivalent to 1,000 tons). Each ton can be calculated to be US\$ 2,300, resulting in a sub-market of **US\$ 2.3 Million** (non-biodegradable plastics),
 - For coffee and cocoa plants, more than 1,000,000 nursery bags are needed each year (**about US\$ 0,3 Million**).
- Taking additional agricultural applications for mulching films, nursery and ripening bags into account, the domestic market for such products easily exceeds **US\$ 10 Million** per year. Given the case that the same products have to be made biodegradable, this would result in a market of around **US\$ 40 Million**. Biodegradable products are 4 times more expensive than non-biodegradable. Estimating that 20% of these products can be realistically substituted by biodegradable plastics within the next 3 years, the domestic market adds up to **US\$ 8 Million**. When targetting the entire ECOWAS, the market might be 5 – 7 times higher.



Competitiveness Initiative 1: Initiating new and sustainable product applications for high growth areas

Business Case 3: Mulching films and nursery bags made of bioplastics

Examples for investments to shift from PE film manufacturing to PLA for biodegradable applications

Technical risk: High

- The entire manufacturing process has to be changed. A key challenge is to run a well-functioning and stable compounding system to assure perfect melting and rheological behavior of resin before entering the screw-extruder.

Economical risk: medium

- Medium high investments for adapting the manufacturing process is needed.

Devices / activities	Explanation	Investment*
Twin-screw extruder	Twin-screw extruder is needed for the manufacturing of degradable plastics.	US\$ 100,000
Compounding system	Highly accurate feeder as well as compounding system needed.	US\$ 125,000
Water bath, air wipe and pelletizer	Additional equipment to assure proper formulation as well as melting before the extrusion process.	US\$ 100,000
Set-up new, stable manufacturing process	Extensive test series have to be undertaken to control new manufacturing process (personal, material, energy, etc.), external expertise.	US\$ 50,000
Sum		US\$ 375,000

Typical investments: US\$ 300,000 – 500,000.

Return on investment: 4 - 5 years, based on standard depreciation.

Source: Own calculation,

* Budget calculated for new devices, mid-tech quality, European market prices, own calculation

Competitiveness Initiative 2

Towards Advanced Plastics Manufacturing

Competitiveness Initiative 2: Towards advanced plastics manufacturing

Rationale

The manufacturing process within a firm represents the essential competitive advantage. It essentially determines the costs for the final product, the functional product properties, the product range to be manufactured and the quality. Nowadays, the demand on productivity, flexibility and quality are increasing. Declining production figures per unit and increasing individualization urges the adoption of flexible manufacturing. The production of recycled plastic material or bioplastics increases the demand for new manufacturing processes. All this means that the demand for modern manufacturing process technology continues to rise.

Investments in flexible manufacturing would benefit plastics manufacturers in Cote d'Ivoire in the following ways:

- Ability to enlarge product portfolio of footwear since different types of shoes can be manufactured due to flexible manufacturing (lower conversion time between different shoe mouldings),
- Ability to manufacture small product batches at competitive prices (moving from mass production to more customization),
- Possibility of faster shifting between different packaging solutions (faster changing of molds),
- Ability to shift between products with virgin and recycled content within short time periods.

Goals

To stimulate private investments aiming at:

- Improving competitiveness of Cote d'Ivoire plastics manufacturers by advanced efficiency, flexibility and quality of plastic manufacturing processes, or,
- Enabling and facilitating new and sustainable high-growth plastic products based on enhanced manufacturing processes.

Issues addressed

The mainstream plastics manufacturing industry in Cote d'Ivoire is exposed to increased global competition. Lack of investment readiness of domestic firms has often led to outdated manufacturing equipment. This has resulted in low productivity, quality issues and inability to manufacture new plastic products. Upgrading the plastic manufacturing capabilities in Cote d'Ivoire is a precondition to shift to plastics circular economy since it can boost economics and the quality of recycled and bioplastic content of future products.

Competitiveness Initiative 2: Towards advanced plastics manufacturing

Target Group

Mainstream plastics manufacturers ready to invest in new or flexible manufacturing processes or quality control measures.

Actions implemented within the Competitiveness Initiative

- Preparation of investments:
 - Awareness-raising to motivate mainstream plastics manufacturers to consider upgrading of manufacturing technologies, / processes towards flexible production,
 - Technical feasibility studies to estimate technical risks connected with investments,
 - Technical expert advice to identify critical success factors,
 - Support to prepare bankable loans and investment plans to ease access to finance.
- Facilitation of investments:
 - Facilitation of access to finance,
 - Moderation of negotiations with banks / investors / deal-making.
- Post investments activities
 - Workforce development,
 - Expert advice and hands-on coaching to implement international quality standards (e. g. ISO 900x, ISO 14001).

Success factors for implementation

- Uncomplicated access to finance,
- Attractive conditions with low administrative barriers to stimulate investments,
- Mobilization of broad spectrum of beneficiaries,
- Focus on business-driven investments.

Competitiveness Initiative 2: Towards advanced plastics manufacturing

Expected impact per investment

- Reduction of conversion time up to 60%,
- Increased productivity by 20%,
- Improved quality control system leads to less scrap, more stable manufacturing processes and higher quality of end-products,
- Reduced energy and conversion time lead to lower of production costs up to 20%,
- Reduction of carbon footprint,
- Ability to integrate recycled raw material into manufacturing processes,
- Ability to manufacture bioplastics products, and
- Improved product spectrum through lower conversion time and ability to manufacture smaller product batches.

Competitiveness Initiative 2: Towards advanced plastics manufacturing

Business Case 1: Flexible manufacturing

Example of investment needed to improve current manufacturing processes (capacity of 200 – 300 kg / h):

A plastics extrusion firm is interested in increasing the flexibility of existing machinery and related processes to lower conversion time. Both organisational and technical measures need to be applied in addition to the corresponding investments.

Technical risk: Low

- Since the key manufacturing process itself is not changed, the technical risk can be considered to be low

Economical risk: Low

- Moderate investments for tools, machine parts and peripheral technology

Devices / items needed	Explanation	Investment*
Tool preheating station	Using preheated tools lowers conversion time. Rapid cycle molding is key for fast and flexible manufacturing.	US \$ 10,000
Quick coupling systems for tools	Flexible manufacturing needs quick disconnect couplings of tools to save time during tool change.	US \$ 10,000
Machine parts	Additional machine parts, like injection units or screws are needed	US \$ 15,000
Tool parts	Additional tool parts are needed to gain higher flexibility.	US \$ 10,000
Tool cleaning	Rapid cleaning and maintenance of exchanges tools	US \$ 10,000
Additional hand tools	Hand tools are needed to tools and device handling.	US \$ 10,000
Installation and training	Prototype series to make workers familiar with new manufacturing approach and training of workers	US \$ 10,000
Sum		US\$ 75,000



Typical investments: US\$ 75,000 – 100,000.

Return on investment: 3 years, based on standard depreciation.

Competitiveness Initiative 2: Towards advanced plastics manufacturing

Business Case 2: Quality control for manufacturing

Case:

Establishment or expansion of a test laboratory for quality control for carrying out plastic-specific material tests. Testing laboratories are a central contact point for manufacturing firms to carry out incoming goods and series of tests. Furthermore, in the event of damage to a component, they serve to investigate the causes and draw up an objective report. Quality control is of dedicated importance in CDI since the conformity assessment and standardization system is at an embryonic stage.

Technical risk: **Low**

- Training and introduction of self-responsible action (performance of tests and documentation of results) takes time,
- Setting-up internal quality management system,
- Eventually, additional construction or renovation effort.

Economical risk: **Low** (basic solution) – **high** (high-end solution)

The economic risk depends basically on the amount of investment

- **Basic version:** a laboratory with minimal equipment is set up to carry out the most important plastics-related tests. This can be extended at any time and in small steps by further testing possibilities and/or capacities of existing tests.
- **High-end solution:** a laboratory is equipped to the highest standard with high-tech testing equipment in order to address all industries immediately.

Return on investment:

Quality control is more an enabler for manufacturing recycled or new materials as well as for improved quality. Quality control also contributes for more stable manufacturing processes and lower scrap rates.

Competitiveness Initiative 2: Towards advanced plastics manufacturing

Business Case 2: Quality control for manufacturing

Comparison of the two different investment cases (basic version and high-end solution)

Devices / items	Investment for basic solution* [US\$]	Investment for high-end solution* [US\$]
Personnel capacity (p.a.)	1 full time equivalent	2 – 3 full time equivalents
Devices	Minimum three testing devices <ul style="list-style-type: none"> • Melt flow index tester (MFI), • Testing thermal property of plastic materials (VICAT), • Optical measurement (microscope). 	Around 6 – 8 testing devices <ul style="list-style-type: none"> • Melt flow index tester (MFI), • Testing thermal property of plastic materials (VICAT), • Optical measurement (microscope), • Chemical analysis (infrared spectroscopy), • Determination of viscosity of plastics, • Charpy Impact testing.
	Sum: US\$ 75,000	Sum: US\$ 350,000
Investment in training of staff	US\$ 5,000	US\$ 15,000
Investment in infrastructure	US\$ 10,000	US\$ 20,000
Sum	US\$ 90,000	US\$ 385,000



Typical investments: US\$ 90,000 – 400,000.

Return on investment: unpredictable, depending on stability of manufacturing process.

Investment driven by technical need rather than by pure economic benefits.

Competitiveness Initiative 3

Improving Capacities for Plastics Recycling

Competitiveness Initiative 3: Improving capacities for plastics recycling

Rational

In general, there is an increased demand from industry to use more recycled content plastics. Key drivers are the interest of the plastics manufacturing sector to reduce dependency on global virgin plastics suppliers as well as the need to reduce plastic pollution through re-use. Furthermore, the former government agreed with industry to refrain from further sharpening the ban policy if the industry would use more recycling.

However, the sorting system in CDI is still in an embryonic phase. Sorting of plastics waste is conducted manually, mainly by women on site. Recycling, if any, is mainly done internally on the firm level. Many mainstream plastic manufacturers sort and recycle their sprues, scrap, etc. and return it to the manufacturing process. Further collection is done by the informal sector but only for high-price plastic waste, like HDPE, PP or LDPE.

Many mainstream plastics manufacturers are interested in increasing their own recycling capacities for various reasons. Mainly because once fully industrialized, recycled plastic raw material is 20 – 30% cheaper than virgin plastic and there is less price-dependency on the world oil price. Thus, using recycled plastic raw material has become more predictable. However, firms tend to build up their own recycling facilities since commercial recycling facilities are limited and the quality and purity of recycled raw material can be uncertain. Having their own recycling facilities has many added benefits for the firms.

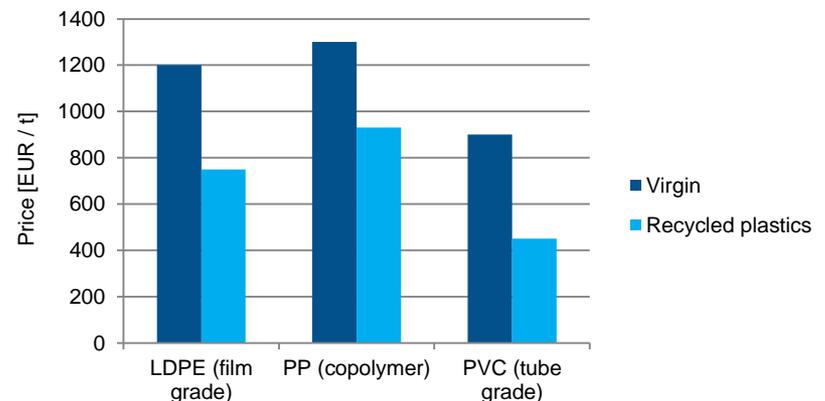
Goals

To stimulate private investments aiming at:

- Increasing industrial capacities for plastic recycling,
- Support plastic manufacturing industry to move to plastics circular economy by using more recycled content plastics,
- Reduction of price for recycled plastic raw material by ramping up related capacities.

Different market prices of selected virgin and recycled plastic materials

Europe, June 2019



Competitiveness Initiative 3: Improving capacities for plastics recycling

Issues addressed

Côte d'Ivoire plastic manufacturing industry competitiveness strongly depends on the world market price of oil since most plastic products are price sensitive. Using more locally produced recycled plastic raw material can be a good option to reduce such dependencies.

Since the capacities of commercial plastics recycling firms is limited and no recognized conformity assessment system exists in Côte d'Ivoire, plastic manufacturers tend to do recycling on their own.

The issue addressed by this Competitiveness Initiative is how to significantly increase the domestic plastics recycling capacities by supporting private investments in recycling equipment. The current bottlenecks include:

- Lack of industrial capacity to do more recycling,
- Lack of technologies available to recycle plastics from local resources comprised of mixed plastic waste.

Target Group

Mainstream plastics manufacturers interested in building up their own recycling facilities as well as commercial firms specialized in plastics recycling.

Competitiveness Initiative 3: Improving capacities for plastics recycling

Actions implemented within the Competitiveness Initiative

- Preparation of investments:
 - Awareness raising to motivate mainstream plastic manufacturers to consider investments in recycling,
 - Technical feasibility studies to estimate technical risks connected with the planned investments,
 - Technical expert advice to identify critical success factors,
 - Support to prepare bankable loans and investment plans to ease access to finance.
- Facilitation of investments:
 - Facilitation access to finance,
 - Moderation of negotiations with banks / investors / deal making.
- Post investments activities:
 - Workforce development.

Success factors for implementation

- Uncomplicated access to finance,
- Access to sufficient amount and quality of pre-selected plastics waste,
- Growing market and demand for recycled content plastics,
- Tailor-made support activities.

Expected impact

- Increased competitiveness of firms benefitting from cheaper (recycled plastic) raw material,
- Increased availability of high-quality and affordable recycled plastic material in the domestic market,
- Reduced import of virgin plastic raw material (resins),
- Increased proportion of recycled plastic in plastics production,
- Higher share of re-use of plastics waste,
- Contribution to the circular economy in plastics.

Competitiveness Initiative 3: Improving capacities for plastics recycling

Market drivers

- Côte d'Ivoire mainstream plastics manufacturers intend to reduce dependency on plastics raw material from world market prices by using more locally produced recycled plastic raw material,
- Increased environmental concern with regards to plastic waste pollution pushes plastic manufacturers and end-users to shift to more environmental friendly plastics, like recycled plastics,
- Increasing concerns regarding further sharpening the ban policy are pushing industry to use more recycled plastics,
- New recycling technologies facilitate good recycling quality even from ordinary household waste for a reasonable price,
- Start-ups with innovative ideas on how to collect plastic waste are entering the well-established plastics manufacturing sector and are contributing to a higher availability of pre-selected plastic waste.

Market estimation (by 3 years period)

- Plastic waste generated in Côte d'Ivoire can be estimated at 190,000 - 200,000 tons per year. There is low utilization of plastic waste in Côte d'Ivoire. Less than 10% of plastic waste is entering the recycling value chain,
- About 9,000 tons of HDPE, PP and PVC, 6,000 tons LDPE and 5,000 tons of PET (collected by the informal sector or recycling firms) were recycled in 2018 (about 20,000 tons in total). The majority originates from household waste,
- The domestic market for plastics manufacturing can be calculated for 2018 to be around US\$ 500 Million or 335,000 tons. Based on firm-level interviews, the domestic demand for recycled plastics raw material can be calculated at 15% of the total market (equivalent to **50,000 tons**),
- The industrial demand of 50,000 tons recycled plastic would result from a plastics waste recycling rate of around 25% (It is currently 10% in CDI and over 30% in Europe). Taking into account an average market price of US\$ 1,200 per ton of recycled plastic, the estimated market is about **US\$ 60 Million** per year.

Competitiveness Initiative 3: Improving capacities for plastics recycling

Business Case 1: Recycling machines

Different investment levels for recycling, depending on quality of recycled raw material or purity of waste available (I)

Type of waste to be recycled	Actions / items needed	Investment* (new machines)	Additional activities recommended
Industry (internal plastic waste collection).	<ul style="list-style-type: none"> De-dusting facilities, Grinding equipment. 	US\$ 35,000	
Industry (external source, but well pre-sorted).	<ul style="list-style-type: none"> Metal-detecting unit, De-dusting facilities, Grinding equipment, Using melt filter. 	US\$ 50,000	<ul style="list-style-type: none"> Minimum of quality control devices recommended.
Household waste (pre-sorted, mixture of plastics).	<p>Basic version for minimum purity for different kinds of plastics (only plastics!):</p> <ul style="list-style-type: none"> Prerequisite: Waste is pre-sorted by size: optical (camera) and/or gravimetric (scale) separation. If not: (US\$ 180,000), Pre-grinding for size standardization (US\$ 35,000), Washing unit (US\$ 10,000), Magnetic separator for metals (US\$ 10,000), Fine grinding (US\$ 15,000), Dedusting facilities (US\$ 10,000), Air classifier (for plastic type) (US\$ 30,000), Optical classifiers (color) (US\$ 30,000), Packing station (US \$ 20,000). 	<p>US\$ 340,000 with pre sorting plant</p> <p>US\$ 160,000 without pre sorting plant</p>	<ul style="list-style-type: none"> Mechanical pre-selection, Minimum purity, and Quality control unit is a must.



Competitiveness Initiative 3: Improving capacities for plastics recycling

Business Case 1: Recycling machines

Different investment levels for recycling, depending on quality of recycled raw material or purity of waste available (II)

Type of waste	Actions needed	Investment* (new machines)	Additional activities recommended
Household (untreated)	<p>Fully-automated version (1,000 t/month):</p> <ul style="list-style-type: none"> • Recycling unit for identification of glass, wood, metal, stone and bio-waste (US\$ 275,000), • Pre-grinding for size standardization (US\$ 25,000), • Washing unit (US\$ 10,000), • Magnetic separator for metals (US\$ 10,000), • Fine grinding (US\$ 17,000), • De-dusting facilities (US\$ 10,000), • Air classifier (for plastic type) (US\$ 30,000), • Optical classifiers (color) (US\$ 30,000), and • Packing station (US\$ 23,000). 	US\$ 430,000	<ul style="list-style-type: none"> • Fully automated, • Quality control is a must, • Qualification of plant technicians.

Return on investment: 3 years, depending on overall investment and operation cost of recycling machine.

Potential savings: US\$ 100 per ton when using self-recycled plastic waste compared to virgin plastic.

Estimation: overall annual saving based on 5,000 tons production capacity: US\$ 600,000 p. a.

Competitiveness Initiative 4

Association Ivoirienne pour la Valorisation
des Plastiques (Ivorian Association for
Plastics Valorization) - AIVP

Action Line I: Setting up AIVP

Rationale

Collection of plastic packaging cannot be the sole responsibility of the public services. It has to be understood as a joint activity of the private and public sectors. Currently, there is still a lack of understanding between the two groups which must be bridged. AIVP is leading an initiative to recover post-consumer plastic packaging waste by operating as platform for PPD. On the basis of the current results, private and public sector stakeholders stressed the importance of stimulating, developing and encouraging a collaborative action platform for initiatives involving the collection and recycling of plastic waste to promote a circular economy and reduce environmental impact in Côte d'Ivoire. These findings include the following:

- Recoverable waste is not sorted, so waste collection remains incomplete,
- The public service has delegated responsibility for waste collection to two private operators whose quality of service is satisfactory for citizens and the public service,
- The challenge remains that only 56% of household plastic waste is collected and the rest (2,750 tons per day) is uncontrolled and ends up as pollution in the environment.

Goals

- AIVP would advance the idea of circular plastic economy through aligned policy, infrastructure, networking and advocacy,
- Collection and sorting of plastic waste at the source to assure clean plastics and material recycling,
- Promote and advocate for the use of recycled content plastics in order to increase the corresponding demand,
- Raise public awareness of environmentally friendly behavior through active participation in all national and international civic cleaning activities organized by the Ministry of Environment and the UN Environment Program,
- Involve NGOs in the culture of sustainable development.

The promoting of the circular plastic economy will brand Cote d'Ivoire as leading in sustainability in ECOWAS. Becoming more visible, effective recycling practices will attract investment and business opportunities. It will help plastics manufacturers and related sectors (construction, building, agriculture, food and beverages, shoes) to take better advantage of the recycled material.

Action Line I:

Setting up AIVP

Implementation challenges

- Administrative / legal challenge: Agree on legal statutes, governance structure and other modalities,
- Mobilization challenge: Involve a critical mass of actors from public and private sectors,
- Financial challenge: Find sufficient resources to implement key activities to demonstrate AIVP to be an agile and active network,
- Strategic challenge: Motivate members to actively contribute and agree on common goals and actions.

Actions

- Establish of AIVP by October 2019
 - *Establishment of the statutes, internal regulations and the charter of ethics and good governance,*
 - *Constitution of 5 commissions for an optimal management of the association Communication, Fundraising and partnership development (Coca Cola, Nestle), Technical (Violia, Recyplast, SCI, Anteja), Regulatory and ethical monitoring (Coca Cola, Nestle),*
 - *Drafting and implementation of a letter of commitment from the directorates representing the members of AIVP, and*
 - *Enlargement of membership : 15 members.*
- Contribute to the intensification of public-private collaborative actions (with the help of the CCESP) e.g. develop and launch a municipal demonstration project,
- Development of a plastics waste management plan by the end of 2019,
- Establish a monitoring and evaluation system, by the end of 2019,
- Advocacy/promotion: Communication commission (media, top management, special events). Signature of commitment letter by end of 2019.

Action Line I:

Setting up AIVP

Partners

Private sector:

- Recyclers: Recyplast, Coliba, Veolia,
- Manufacturers : Coca-Cola, Nestlé, Unilever, Danone, LGI, BASF, Solibra, Prosuma, Filtisac, Pepsi Co,
- Research firms and universities: FHB University, Anteja ECG, SCE.

From the public sector:

- Ministry of Sanitation and Hygiene (MINASS) - National Waste Management Agency (ANAGED),
- Ministry of the Environment and Sustainable Development (MINEEDD) - Direction de l'Economie Circulaire et de la RSE,
- Ministry of Industry, Trade and SME Promotion,
- National Bureau of Technical Studies and Development (BNETD),
- CCESP: State Consultation Committee (Under the Ministry of Economy and Finance, CCESP facilitates interaction between the public and private sectors).

Action Line I:

Setting up AIVP

Expected results / impact

- AIVP becomes a well recognized platform and plays an active role in setting up pilot projects for waste collection and recovery as well as in evaluating the effectiveness of these economic models,
- Pilot tests on the pre-sorting of clean plastic are successfully implemented in two areas with achievable targets of 300 tons / 4 months of recyclable and clean plastic waste,
- Increased awareness of public and private sector on how to best avoid plastic waste pollution,
- Communication strategy implemented on the actions and achievements of the association.

Responsibilities and obligations

- Establishment of AIVP, coordination and enlargement of membership. Coca Cola will coordinate an action with the support of Anteja ECG,
- Develop and launch a municipal demonstration project. Recyclast will coordinate with support Veolia, SCE, ANAGED.
- Development of a plastics waste management plan: Veolia coordinate, SCE, ANAGED, CCESP,
- Establish a monitoring and evaluation system: Veolia will coordinate with support of Recyclast, SCE, ANAGED, CCESP,
- WHO fundraising and partnership development, MNC,
- Advocacy / promotion, Coca Cola, NGOs, UNEP,
- Public private development initiatives, CCESP.

Action Line II:

Municipality Demonstration Pilot: From Waste to Resource Collection

Rationale

The increase of the value of the recycled materials depends on the efficiency of the collection and sorting process. Municipalities can play an important role in this process by providing space and logistical and administrative support for waste collection. This potential is still unrealized since municipalities are not yet seen as functional support systems for waste collection.

The Municipality's demonstration project is based on a set of ongoing pilots that will make it possible to test the effectiveness of plastic sorting at the source in a PP partnership.

- Recyclast with the Plastock project has committed to cover the costs of operating, communicating and purchasing plastic waste for a total amount of 72,500,000 XOF to work in two municipalities in collaboration with AIVP,
- Nestlé is cooperating with the public sector in a pilot project to source-sort 3 districts in 3 municipalities representing 1,500 households. Nestlé is funding this study to identify the waste that can be collected and the technical and financial feasibility of source separation,
- Along this line, other pilot projects are being studied to reduce the flow of waste being sent to landfill and to increase the collection of recoverable materials.

Goals

The Municipal Demonstrator (demonstration project) will champion the development of a plastic resource collection system for better separation and recovery of plastic materials for manufacturing products with a high content of recycled materials. The Demonstrator will provide the needed spark for uptake of recycling and use of recyclates for industrial applications. It will also encourage the adoption of sustainable business models. Recycling practices will be prioritized above landfilling and will link the public and private actors in a circular economy at the municipal level.

Action Line II:

Municipality Demonstration Pilot: From Waste to Resource Collection

The municipalities of Cocody and Yopougon have been selected to host the pilot phases with a coverage of 12km² each. Specific goals are:

- Collect 150 tons of clean plastic waste per municipality during the project implementation period to recycle PE/PP/PE for export and local industries,
- Generate empirical evidence about appropriate areas for the installation of collection boxes and current waste management ANAGED,
- Obtain authorization for the pilot project,
- Support recycling firms to get better access to plastic waste and to provide a constant and sufficient inflow of pre-selected plastic waste,
- Set up boxes for plastic waste collection,
- Develop an advanced waste management system for resource collection, management and deployment on an industrial scale.

Expected results / impact

- Determination of feasibility of municipalities playing an important role in the context of plastic waste collection.
- Stronger role of municipalities in supporting waste collection,
- Better knowledge through ongoing studies with Nestlé and SCE regarding the sources of plastic waste consumed and the possibility of collecting it at the source,
- Improved availability of collection facilities and collected plastic material,
- Plastic waste resource supply chain established with contributions to the overall rise in plastics recycling rates by allowing better accessibility to used plastic materials and avoiding landfilling.

Action Line II:

Municipality Demonstration Pilot: From Waste to Resource Collection

Implementation Challenges

- *Administrative/ legal challenges:* Modalities and conditions applicable to the availability of plastic waste and waste collection exclusively rest with the public sector. The capabilities of municipalities are not absolutely clear and need to be clarified beforehand. While collection locations can be handled by municipalities, the regulatory issues which are important for collection and recycling at the industrial scale are under the mandate of the ministries,
- *Mobilization challenges:* Another challenge is to motivate municipalities to take over the intended role. Municipalities might not understand the added value and might be reluctant because of financial risks or potential negative impact if the approach fails,
- *Communications challenges:* Establishing communication and cooperation between actors along the plastics value chain and between public and private sectors for purposes of promoting creation of value along the circular plastics system.

While the Municipality Demonstrator can be implemented by the private sector and the municipality, a considerable amount of political support will be essential for the uptake the circular plastics economy to reach industrial scale. Considering the intentions and declarations of the Sanitation Minister Anne Ouloto, the motivation is present and the technical and human resources are available while financial are missing.

Action Line II:

Municipality Demonstration Pilot: From Waste to Resource Collection

Partners –From the private sector:

Partners listed below are at the core of the initiative

- Recyclers: Recyplast, Veolia, Coliba,
- Multinationals: Nestlé, Coca Cola,
- Specialized engineering offices such as SCE.

The partnership will be enlarged by

- Plastic mainstream manufacturers that are interested in returning selected plastic waste to their production process e. g. Plastica, Proplast, Cotiplast, Europlast,
- Collection operators : Ecoti, Eco-eburnie.

Partners from public sector

- Municipalities Cocody and Yopougon,
- CCESP - under ministry of Economy and Finance,
- The town halls - Les Mairies,
- Ministère de l'Assainissement et de la Salubrité (MINASS) - Agence Nationale de Gestion des Déchets (ANAGED),
- Ministry of Sanitation and Hygiene (MINASS) - National Agency for Waste Management (ANAGED),
- Ministère de l'Environnement et du Développement Durable (MINEDD) - Direction de l'Economie Circulaire et de la RSE,
- Ministry for the Environment and Sustainable Development (MINEDD) - Department for Circular Economy and Corporate Social Responsibility,
- Ministère de l'Industrie, du Commerce et pour la Promotion des PME,
- Ministry of Industry, Trade and the Promotion of SMEs.

Action Line II:

Municipality Demonstration Pilot

Funding:

- An estimated financing of 75,000,000 XOF (US\$ 128,000) per municipality is needed to purchase of 10 crates and one compactor,
- Recyplast, has committed to covering the costs of operating, communicating and purchasing plastic waste for a total amount of XOF 72,500,000 for the two municipalities,
- The remaining XOF 77,500,000 is to be covered by the AIVP.

Actions Steps

- Establish a Partnership for a demonstration pilot by the end of October 2019. Recyplast and Violi will coordiante the action with the support of AIVP,
- Develop a plastic waste management plan in collaboration with model municipalities. Violaia and Nestlee will coordinate the action with the support of AIVP,
- Conduct studies regarding the management of waste in Abidjan to get insights in collection rates by district. SCE will coordinate the action with the support of AIVP,
- Set-up collection sites / points according to the waste management plan,
- Implement the entire waste management plan and assure sufficient capacities for recycling of collected plastic waste.

Actions	Leading public partner	Leading private partner
Collect information on the mapping of areas to be covered in Cocody and Yopougon for the installation of collection boxes	BNETD	Veolia
Collect information and assess current ANAGED	ANAGED	Veolia
Obtain authorizations for the pilot project	MINASS / Town halls	Veolia
Set up boxes and proceed with the management of the plastic wastes collection	- Cocody - Yopougon	Recyplast

AIVP

Good Practice I: UNICEF – Classroom facility building initiative

Activity : Conceptos Plásticos is a Colombian company created in 2009 with strong social and environmental impact (social entrepreneurship, circular economy, sustainability, inclusiveness). It has developed a technique for making bricks from plastic waste that are cheaper, lighter and more durable than conventional bricks.

Partners : Unicef is the primary partner since it is the contractor for the construction program of 528 classrooms in Côte d'Ivoire. Their objective is to address the plastic and housing crisis pursuant to the UN Sustainable Development Goals (i.e. poverty eradication by providing housing for the poorest; access to decent work; sustainable cities and communities; responsible consumption and production; and combating climate change).

Supply : Formation of women's associations starting with 4 groups of 50 women to collect plastic in different areas. Conceptos Plásticos aims to hire 1000 women by March 2020. These women will be supplied with tricycles, trained to collect waste and to build classrooms. A classroom represents about 5 tons of plastic waste and can accommodate 40 students. 2640 tonnes of plastics will be recycled, with the objective of processing 4,800 tons per year.

Why it is a success : It is a form of South-South cooperation as the environment in Colombia is close to the one in Côte d'Ivoire. A successful experience in Colombia it is also likely to be successful in Côte d'Ivoire. Unicef's reputation and all of its associated communication channels has allowed the project to receive extensive media coverage in Côte d'Ivoire and internationally.

Challenges : Beyond the 6-month contract, it will be necessary to sustain the activity with new orders. As construction with plastic materials is relatively new, it will be necessary to convince the builders to use the material. Also, access to waste will not be so simple as CET as transfer centers are closed to the public.

Incomes generated : For the women association, between 6-8 US\$ / day.



Source: Own investigations, interview with Conceptos Plásticos



AIVP

Good Practice II: Waste Recovery Units (UVD)

Activity : In 2014, the former Authority for the Disarmament, Demobilisation and Reintegration (ADDR) of ex-combatants created 19 Waste Recovery Units (UVDs) in the form of simplified cooperative companies. These UVDs, located in the major geographical areas of Côte d'Ivoire, had as their main missions to collect, sort and recycle waste (incl. plastic waste). The products resulting from the recovery of this waste were sold on the market (e. g. as household paving) or to plastics manufacturers (as bales of plastic bags obtained after washing, drying and compaction).

Partners : Many plastics manufacturers partnered with UVD to assure stable plastics waste supply. COTIPLAST was the largest customer of UVD, but also PLASTICA, MULTIPACK, and INTERPACK.

Supply : The UVDs were well managed. They had real technical skills in plastic waste sorting and were able to recognize all resins, quickly and without errors. The UVD were based on a network of informal depots called "boxes" which were collected by small vehicles and paid by weight (between 0.17 and 0.50 US\$ per kg).

Why it is a success: Since the UVD succeeded to play a role in contributing to the resolution of environmental, social and economic problems, the Ivorian government, through the Ministry of Sanitation, Environment and Sustainable Development, decided to provide them with support in terms of supervision and operational capacity-building in order to make them successful companies. (Ex-UVD Attekoubé collection material is worth 25 FCFA).

Challenges : Their source of waste has dropped sharply due to the closure of the Akouédo landfill (80% drop according to them). Ex-UVD Attekoubé used to work mainly in Abidjan (80%). Now they need to find the plastic wastes from outside as they have high logistics costs.

Incomes : Variable, around 8-10 US\$ / day.

AIVP

Good Practice III: SCB / COTIPLAST - Recycling Banana bags with Cotiplast

Activity: SCB is the leader in Côte d'Ivoire in the production of exotic fruits, mainly bananas (e. g. 220,000 tons of bananas / year). The production of bananas requires the use of many protective plastic bags (plastic protection sleeves). This represents 360 tons of LDPE to be recycled each year.

Partner: Cotiplast initially focused on the production of plastic bags. The company gradually diversified into the production of agricultural films, woven bags and flexible packaging. Cotiplast has invested nearly **2.2 US\$ Million** for an agricultural plastic film production line based on recycled products with a capacity of 6,000 tons / year.

Supply : The production of bananas is done outside Abidjan and the recycling of bags at Cotiplast in the Economic Zone of Yopougon. A system has been in place for several years between SCB and Cotiplast to recycle all used ripening bags. The SCB collects the used bags and delivers them in bales at their depot in Abidjan. Then Cotiplast has to collect plastic bales for recycling.

Why it is a success: Cotiplast, focused on the needs of the agricultural sector, has been able to meet the expectations of fruit producers who must justify recycling their waste for their export market.

Key obstacle : With the rapid changes in regulations and demand from on the European markets, the 2 firms must anticipate changes such as:

- demand for washing and reuse of plastic rather than recycling; and,
- introduction of biodegradable plastics).

All of this might increase the logistical costs for each company.

Incomes: (Not available for public disclosure)



Source: Own investigations, daily stars



Competitiveness Initiative 5

Policy Reforms for Circular Plastics Economy

Competitiveness Initiative 5: Policy Reforms for Circular Plastics Economy

Rationale

The plastics manufacturing industry is very important to the Ivorian economy. Nevertheless, there is an urgent need to tackle the environmental problems caused by the increased use of plastics. Besides private investments and public private partnership activities, policy reforms are also needed to support the local industry and society to move to a more circular plastic economy. Policy reforms can stimulate the domestic demand for recycled plastics by certain targeted interventions. It can also initiate greater cooperation by all its key players, from plastics producers to recyclers, retailers and consumers.

Goals

Political reforms should create a favorable business environment to ensure the competitiveness of the plastics manufacturing industry and contribute to a positive investment climate. They should also serve to pave the way toward a recycling economy. At the same time, the reforms shall not overburden the Ivorian industry and society with unclear regulations or ambitious interventions. Done in a proper way, current challenges can be turned into new business opportunities increasing the sustainability of the plastics manufacturing industry.

Issues addressed

The proposed policy reforms are consistent with various private initiatives and primarily address the following problem areas:

- Lack of clarity and predictability of the plastic ban,
- Incomplete implementation of existing obligations,
- Embryonic market for recycled plastics,
- Lack of clarity on standards related to recycled plastics usage.

Target Group

Private sector and society as a whole.

Responsibilities:

Policy and governmental authorities.

Action Line I: Improvement of national plastics policy and its implementation

Rationale

In 2014, the government of Côte d'Ivoire set new rules for the use of plastic by issuing Decree 884-2014. However, this decree remains unclear in many points and does not sufficiently promote the use of green plastics alternatives. Also, in the context of the current policy, it is not clear whether a further tightening of the ban on plastic is to be expected or not. An inconsistent implementation of the plastic ban policy or corresponding regulations led to competitive disadvantages for the industry. All this resulted in a high level of uncertainty among the industry and had negative impact on investment readiness of the plastics manufacturing industry. If this situation remains unchanged, Ivorian plastics manufacturers are likely to lose competitiveness.

Specific goals

- Develop predictable and long term policy framework for the manufacturing and use of plastic products, notably packaging,
- Revision of the plastic ban to reach more clarity and promote recycled content plastics and bioplastics application,
- Consequent implementation of plastic ban policies and related regulations.

Implementation challenges

- *Readiness* of industry and policy to find a compromise that suits all parties,
- *Ability* of parties involved to transform a complex challenge into implementable measures,
- *Capability* of the public sector to implement related regulations in a consequent and equal manner.

Actions:

- Setting-up working group (with AIVP) to review the current decree and ensure that relevant stakeholders are sufficiently involved in the process,
- The revised Decree will be transferred into a legal framework,
- Creation of an action plan to ensure the consequent and fair implementation of the decree.

Expected impact

- Clear and predictable policy framework which provides long term perspectives for the plastics manufacturing industry,
- Increased readiness and willingness of the industry to invest in recycled plastics content and bioplastics applications in other high-growth areas.

Action Line I: Improvement of national plastics policy and its implementation

Good Practice in Policies I: German Packaging Act (VerpackG)

Objective: The law is intended for manufacturers, online retailers and companies that bring recyclable packaging into to market. The law sets clear objectives and regulates the participating parties in such a way that packaging waste is avoided as a matter of priority and prepared for re-use or re-cycling.

Main content: VerpackG

- **Provides a clear definition of packaging.** Sales and secondary packaging ends up as waste with the final consumer who must participate in a system such as the Green Dot that guarantees a nationwide take-back,
- **Defines the target group:** This includes every manufacturer and every distributor who professionally circulates packaging in Germany. Also included are national manufacturers of packaged goods and online retailers. There are no limits established for small companies,
- **Set-up a central register:** Under civil law, the public authority is responsible for registry of manufacturers before they put packaging on the German market. This involves receipt of data reported by manufacturers and oversight of “take-back systems” as well as review of submitted of declarations,
- **Sets clear plastics recycling targets 90%,**
- **Incentives for manufacturers to use ecologically beneficial and recyclable packaging.** The take-back systems shall create incentives for the use of recyclates, renewable raw materials and materials which can be recycled at a high percentage. These incentives shall be reflected in the participation fees.

Dual System - picks up household packaging in parallel to the existing municipal waste-collection systems. Until December 31st 2018, retailers selling to the German market were required to comply with Packaging Ordinance (VerpackV). It transferred responsibility for the disposal from the municipalities to industry. The aim was to allow manufacturers and distributors of packaging materials to share the costs.

On January 1st 2019, the Packaging Act (VerpackG) replace Verpack. The legislator’s aim is not only to make sure companies contribute more to environmental costs, but above all to generally reduce packaging waste as much as possible. In addition, recycling and reutilization will be further promoted. In particular, the use of one-way drinks packaging is to be significantly reduced by the new packaging law.

This system is provided by a range of providers, the biggest one being der Grüne Punkt (Green Dot) Duales System Deutschland GmbH. DSD only collects packaging material from manufacturers who pay a license fee to DSD. DSD license fee payers can then add the Green Dot logo to their package label to indicate that this package should be placed into the separate yellow bags or yellow wheelie bins that will then be collected and emptied by DSD-operated waste collection vehicles.

Action Line I: Improvement of national plastics policy and its implementation

Good Practice in Policies II: Plastics Circular Economy policy toolkit

Elements of plastics circular economy policy toolkit from around the world

Type	Policy	Example
Economic instruments	Landfill taxation, Carbon tax, Separate collection.	Landfill taxation in Denmark and the Netherlands and the Carcon taxes are applied in Australia, Chile and UK Separate collection happens in Germany and Norway
Regulations	Packaging law, Voluntary agreements.	German Packaging Act (VerpackG) European industry voluntary agreement (EU 28)
Information bases	Labelling, Education programmes, Sharing platforms.	EU Ecolabel, Der Gruene Punkt in Germany EU public information campaign on environmental damage caused by plastic waste
Eco-design	Eco-design requirements: durability, reparability, recyclability	EU's Eco-Design Directive
Public procurement and innovation	Targeted public R&D	Denmark, Slovenia and Sweden, EU Circular Economy Finance Support Platform

Voluntary pledges of the European Strategy for Plastics in a Circular Economy: the European Commission called on industry to submit voluntary pledges in order to ensure that, by **2025, 10 million tons of recycled plastics find their way into products on the EU market.** By the end of 2018, 70 pledges had been submitted to the EC by companies and business organizations, including business organizations that represent the full supply-chain for the major producers.

The European Circular Plastics Alliance is made up of more than 90 public and private stakeholders in plastics value chains. The Circular Alliance is part of the European Commission's efforts to reduce plastics waste, to increase the volume of plastic material that is recycled, and to stimulate market innovation. The key objective is to reach 10 million tons of recycled plastics by 2025.

- Fostering short-term, voluntary and coordinated actions and investments: separate collection of plastic waste, investments in sorting and recycling facilities, voluntary standards,
- Reporting on the obstacles to deliver on their pledges, and

Action Line I: Improvement of national plastics policy and its implementation

Good Practices in Policies III: Kenyan Plastic Ban

The case: In 2017, Kenya introduced a law which made producing, selling and using plastic bags illegal, with fines of up to US\$ 38,000 and up to four years of imprisonment. This followed in the footsteps of Rwanda which introduced a similar policy in 2006. This example shows how policy can be used to drive the circular economy agenda, through forcing people to find other solutions.

Impact: The ban has largely been considered to be a success even though some types of plastic bags have not disappeared entirely. Supermarkets and many shops are no longer handing out carrier bags. Leading national mainstream plastics manufacturers are currently investing in greater use of recycled plastic content and are especially trying to replace single-use plastic. Other plastic bags manufacturing companies have diversified their operations in order to produce fabric-based bags, non-woven bags, and pulp paper-based bags among others. The plastic ban policy has also created opportunities for people to develop businesses that make and sell reusable containers and bags.

Challenges: There is an increasing tendency to smuggle plastic bags into the country from neighbouring Uganda and Somalia. There is a high probability for illicit products to enter the Kenyan market due to our porous borders. The country-specific policy decision on plastic bags was not adopted at the regional level. Furthermore, there is a strong need to revise the content of the plastic ban, since it is somewhat unprecise and misleading.

"It is good progress if what we see around is anything to go by. Previously, driving from Nairobi to a place like the Masai Mara you would see plastic bags hanging from trees like flowers after being blown away and getting stuck. We don't see them any more," WWF Kenya's official

Lessons learned: Kenya was, by far, not the first African country to put a plastic ban into force and the content of the ban was not very precise. However, the strict way in which the Kenyan government has implemented the ban has had an amazing effect.

Action Line II: Market development for green plastics

Rationale:

Price and quality of plastics applications are the key success factors in Côte d'Ivoire. This results in a weak market demand for recycled plastics or bioplastics applications (green plastics). It also becomes a major obstacle to move towards a circular plastics economy. The uptake of green plastics in new products is low and often remains limited to low-value applications. Uncertainties concerning market demands are hampering further investments necessary to modernize the plastics manufacturing industry. More uptake is needed to scale-up green plastics production. Nevertheless, the Ivorian plastics manufacturers are ready to undertake significant investments, provided that the market for such products will grow sufficiently.

Specific goals

- Stimulation of market development for green plastics,
- Reduction of investment risks by increasing the demand side.

Implementation challenges

- *Limited intervention possibilities* of the public sector,
- *Lack of public investments* for market stimulation,
- *Weak administrative structures and excessive bureaucracy.*

Actions:

- Establishment a working group (with AIVP) on regulation for circular economy
 - *Benchmarking activities to stimulate mutual learning from peer countries,*
 - *Assessment of regulatory or economic incentives for the uptake of recycled content or bioplastics application,*
 - *Introduction of voluntary labelling for green plastics products for promotion and awareness raising,*
 - *Establishment of a clear regulatory framework for bio-plastics (especially biodegradable plastics),*
 - *Implementation of pilot actions for a green public procurement that incentivizes the use of recycled plastics or bioplastics.*

Expected impact

- Increased demand and positive market development for recycled plastics and bioplastics,
- Upscaling of recycling and manufacturing capacities for recycled plastics and bioplastics,
- Modernization and diversification of domestic plastics manufacturing industry.

Action Line II: Market development for green plastics

Good Practice for Market Development: Circular Economy Slovenia

Slovenia is recognized as one of the most sustainability-oriented countries with dedicated attention to developing domestic markets for green plastics. Home of 2 million citizens, Slovenia has a clear policy for a greener and more circular economy. The capital Ljubljana was recognized as Europe's Greenest Capital in 2016. It showed that the country's effort to make its living as sustainable as possible has reached another level compared to other countries.

GREEN REGULATION

- Green public procurement (GPP) is mandatory: 50% of awarded contracts incorporate green public procurement,
- The green tax –the highest shares of environmental tax revenues in the budget in EU: CO2 emissions, the use of lubricating oils and fluids, environmental pollution due to the generation of waste with end-of-life tires, use of packaging and wrapped goods/generation of packaging waste, and environmental pollution caused by the use of electrical and electronic equipment, including portable batteries and accumulators.

GREEN INVESTMENTS - SMART SPECIALIZATION STRATEGY

As part of its national Smart Specialization Strategy, Slovenia supports 9 dedicated clusters and related firms to increase investments in research & innovation partnerships focused on innovation and export-oriented technological fields and products. The Circular Economy cluster connects firms, training, research institutions, and NGOs into new value chains with closed material flows.

WASTE MANAGEMENT – FOCUS ON MUNICIPALITIES

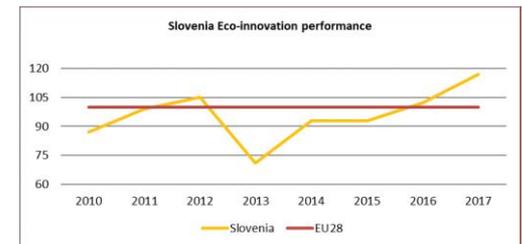
The radical change of waste management policy in 2007 initiated shifts from a nearly all-landfilling society to a predominantly recycling society.

- Focus on separate municipal collections. Municipal waste recycling rates are well above the EU-28 average (58 % vs 46 %),
- Awareness-raising campaigns for citizens.

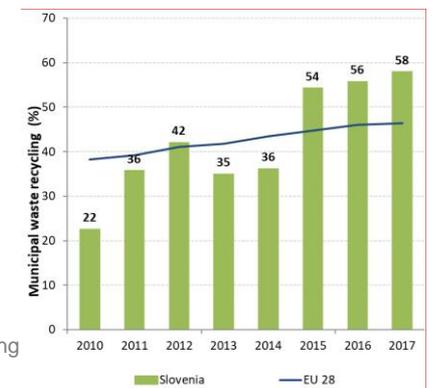
A new waste management plan covering was implemented in 2016:

- Separate bio-waste collection and increased home composting,
- Promotion of high quality compost and digestate for fertilizing purposes,
- A separate collection system operating across Slovenia. It entails a door-to-door collection system to collect bio-waste (covering more than 90 % of the country)

Slovenia's eco-innovation performance



Recycling rate of municipal waste 2010-2017



Action Line III: Standardization

Rationale:

One of the reasons for the low use of recycled plastics is the fear that recycled plastics will not meet customer requirements for a reliable high-volume supply of materials with constant quality specifications. The lack of internationally recognised standards increase the uncertainty and reluctance of manufacturers and end-users to adopt more recycled content products. Missing food safety regulations regarding recycled content plastic also inhibits the adoption of recycled plastics in the packaging sector.

Specific goals

- Use harmonized standard tools to facilitate measurement, and manufacturing of recycled content products,
- Use harmonized standards to facilitate business interactions along the plastics supply chain,
- Use harmonized standards to enable actors along the plastics value chain to comply with relevant laws and regulations,
- Use standards and directives for consumer protection when recycled content products are increasingly adopted.

Implementation challenges

- Weak national standardization, consumer protection and conformity assessment system,
- *Lack of international recognition of testing and certification,*
- *Lack of capacity and experience of CODINORM, the National Standards and Certification body.*

Actions:

- Setting-up working group (with AIVP) with industry to prioritize standardization-related actions,
- Motivate more plastics manufacturers to get engaged in standardization work,
- Evaluation and review of current regulations (packaging, construction, food safety etc.),
- Adoption of international standards (including food safety standards) for sorted plastics waste and recycled plastics,
- Benchmarking missions of CODINORM representative to initiate mutual learning from peer countries.

Expected impact

- Availability of standards and regulations that facilitate plastics manufacturers and end-users to use recycled plastics,
- Improved clarity whether and how recycled plastics comply with standards, laws and regulations.

Action Line III: Standardization



Good Practice Standardization and Certification: EN 15343

Standard EN 15343:2007 Plastics. Recycled plastics. Plastics recycling traceability and assessment of conformity and recycled content

In 2007, the European standard BS EN 15343 was put into force. It specifies the procedures needed for the traceability of recycled plastics. It provides the basis for the calculation procedure for the recycled content of a product.

This standard is applicable without prejudice to any existing legislation. The procedures are needed to formulate or describe the traceability, while the traceability can be used as a basis for calculating the recycled content.

Recycling of plastic waste is one type of material recovery process intended to save resources (virgin raw materials, water, and energy), while minimising harmful emissions into air, water and soil affecting human health. The environmental impact of recycling must be assessed over the entire life cycle of the recycling system (from the waste generation point to the disposal of final residues). To ensure that recycling constitutes the best environmental option for treating the available waste, some prerequisites must be met:

- The recycling scheme being contemplated should generate lower environmental impacts than alternative recovery options,
- Existing or potential market outlets should be identified that will secure a sustainable industrial recycling operation,
- Collection and sorting schemes should be properly designed to deliver recyclable plastics waste fractions fitting reasonably well with the available recycling technologies and with the changing needs of the identified market outlets.

Certification against EN 15343:2007

The European plastics recycling industry can now request certification bodies to confirm their full compliance with EN 15343. This internationally recognised certification scheme strengthens the secondary raw materials market and encourages a higher use of recyclates. The EuCertPlast platform was created to provide information on accredited auditors and certified recyclers to encourage environmentally friendly plastics recycling processes. More than 125 recyclers have been certified to date.