

Circular Economy in Africa-EU Cooperation

Country Report Senegal



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Circular Economy in Africa-EU Cooperation

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Abbreviations

ADIE	Agence de l'Informatique de l'Etat
AECID	Spanish Agency for Cooperation and Development
AFD	Agence Française de Développement
AGC	Artisanal Gold Council
ASM	Artisanal and small-scale gold mining
CE	Circular Economy
CEB	Compressed earth bricks
CRP	City Resilience Program
DAP	Diammonium phosphate
DFVP	Directorate of Green Financing and Partnerships
DPEE	Direction de la provision et des Etudes Economiques
DRS	Deposit return schemes
EITI	Extractive Industries Transparency Initiative
EPR	Extended producer responsibility
FAO	Food and Agriculture Organisation
GEF	Global Environment Facility
GGGI	The Global Green Growth Initiative
GTA	Grand Tortue-Ahmeyim
ICS	Industries Chimiques du Sénégal
ICT	Information and Communication Technology
LNG	Liquefied natural gas
MEDD	Ministry of the Environment and Sustainable Development
NAP	National Action Plan
NPK	Nitrogen, phosphorus, and potassium
PAGE	Partnership for Action on Green Economy
PES	Emerging Senegal Plan
PET	Polyethylene Terephthalate
PROMOGED	Project for the promotion of integrated Management and Economics of Solid Waste in Senegal

PVC	Polyvinyl chloride
SAR	Société Africaine de Raffinage
SEZ	Special Economic Zones
SIAA	Société des Infrastructures d’Affaires Atlantic
SPIS	Solar powered irrigation systems
TVET	Technical and vocational Education and Training
UCG	Unite de Coordination et de Gestion
UMIP	Urban Mobility Improvement Project
WASH	Water, Sanitation and Hygiene
WEEE	Waste electric and electronic equipment

Executive summary

Senegal's development objectives are expressed in the Emerging Senegal Plan (PES) with the vision: *An emerging Senegal in 2035, with a cohesive society under the rule of law*. This strategy outlines Senegal's macro- and micro-economic development goals and objectives. The PES recognises that the green economy is a mean to meeting basic social needs and sustainable development. It has recently been complemented by a national policy on the circular economy, which places the country as a forerunner in West Africa. Senegal is also one of the partner countries of the United Nations Partnership for Action on Green Economy (PAGE). The EU and Senegal have adopted a joint statement outlining possible areas for cooperation, formalised as the 'Dakar Pathways to Advance Circular Economy, Green Industries and Jobs in West Africa'. The identified pathways to advance Circular Economy in Senegal are:

- The role of green industries in paving the way for the broader transition to a circular economy in the region, and globally;
- The potential of waste as a resource;
- Enabling policy and financial frameworks and encouraging innovation;
- A comprehensive awareness raising campaign that promotes new and sustainable production and consumption patterns through education at every level.

Circular economy trends in Senegal

This report focusses on the following four sectors identified as most promising, important politically and economically and relevant for the EU-Senegal cooperation:

- agri-food;
- the chemical industry and plastics;
- construction;
- waste management.

Agri-food, including biomass extraction and fertiliser production, food consumption and food waste beneficiation

The agriculture sector has the potential to support a circular economy with regenerative agricultural practices that contribute to food security and a renewable energy industry based on a steady supply of feedstock from agriculture as well as domestic diversion from landfill of organic waste. But there are complex issues to consider in the sector: A number of farming practices, including livestock, take place in urban areas. This indicates a decentralised depository of generated organic waste. This points to the need for innovative technologies that can address needs in urban sectors. The sector itself needs to be bolstered by a robust capacity building drive that focuses on applying best practices to help the sector leapfrog.

Chemical industry and plastics

Single-use plastics are a pervasive problem in Senegal. The anti-plastics law of 2020 will effectively ban the production and distribution of single-use plastics, however, a plan has not been formulated for implementation of alternatives. The proposed ban of single use water bags has been postponed due to Covid-19 to mitigate transmission risk from shared water containers. Government measures on single-use plastic will require strong focus on awareness raising to ensure buy-in from the citizenry. Current awareness directed at the impacts of littering and does not yet extend to the benefits from a transition to the circular economy.

Construction

The construction sector is primed for adoption of circular economy principles. Eco-construction and production of bio-sourced materials is conducive to circular innovation and new trades. However, a holistic approach to selection of construction materials as well as waste generated, is needed. Coupling this with cost saving resource efficiencies, will help cement the transition to a circular economy. Potential for green jobs in the sector is significant, however capacity building and skills development is a priority for the successful promotion and implementation of eco-construction.

Waste management

For Senegal to become part of global circular value chains, it would need to first ensure systems and frameworks are in place locally, before stepping up globally.

Senegal has ambitions of 'zero waste' with many initiatives and attempts at enforcement to make this a reality. However, very little is implemented due to infrastructure and funding challenges. Waste management in Dakar, and in Senegal as a whole, is fragmented and complex. There is open discharge, no biological treatment, no formal recycling, no waste disposal infrastructure. There are collectors on waste sites who sell recovered materials (plastics, cardboard, metals, glasses, etc.) to the private sector. All this is managed and executed informally. It paints a dire picture for urban sprawl and the coastline. However, an opportunity exists to turn this around. The recently announced project PROMOGED (Project for the Promotion of Integrated Management and Economics of Solid Waste), supported by the World Bank and other strategic partners, namely Spain, France, and the EIB, could help address these challenges and turn this space around. However, there remains scope for further engagement with International bodies for knowledge transfer and ongoing support for best practices.

E-waste is not yet locally regulated, which is worrying considering the volume of end-of-life products flowing into Senegal. A draft decree has been written for the management of WEEE, however, at the time of this report, it has not been adopted. Large collection activity followed by recovery and recycling is identified, particularly in hubs. As recycling activities for WEEE and urban mining intensify, the mining industry will face competition from the secondary-resource markets for metals such as aluminium, copper and gold. The mining industry has the potential to work collaboratively with the secondary-resource sector to develop closed loop systems for these metals.

Based on the scope and analysis of most promising sectors (see above) for a CE transition in this report, it is noteworthy how few large-scale initiatives related to circular economy there are in Senegal, in comparison to the programmes and financial/investment initiatives. This points to areas for development beyond financial to institutional capacity, policy and framework — this applies to both public and private sector engagement. If Senegal is to benefit from circular economy principles, support will be needed to scale-up current initiatives to have more meaningful, lasting impact. Further, large-scale investments will need to come with systemic plans for implementation to ensure holistic and lasting impacts.

Policy framework supporting circular economy activities

Circular economy is politically prominent in Senegal. However, there is a need for clarity on roles and responsibilities, amongst ministerial mandates. Green economy commitments could act as a potential enabler for a circular economy transition: Senegal benefits from the political will to support green growth and opportunity, as the following initiatives show.

- Political strategic alignment is ensured by the Emerging Senegal Plan (PES) which outlines Senegal's macro- and micro-economic development goals and objectives.
- Strategic framework on the green economy is defined with tools for decision making, and promotes green industrialisation and the development of green jobs and businesses. Policies and legislation falling outside the green economy are supplemented by environmental and waste management legislation.
- Strategic and legal frameworks and related projects/programmes, show increasing national awareness to support greening of economy, and facilitate commitment to sustainable development.
- Conducive regulatory framework is indicated by the "Plastic Law" enacted in January 2020 which is expected to revolutionise the way plastic waste is handled in Senegal.
- A study on the concept of the circular economy and its stakes for Senegal has been carried out, giving rise to a roadmap of the circular economy in Senegal proposing actions at various levels of intervention (supply of economic actors, consumer demand and behaviour, green taxation etc.). It should just be noted that this roadmap should be updated.

The main barriers that need to be overcome to establish a circular economy in Senegal are tied to the lack of synergies between stakeholders and insufficiently coordinated policies, together with the lack of financial resources needed to make the transition operational.

Trade and investments in the circular economy in Senegal

Senegal's trade policy is aimed at building a competitive economy, through inclusive growth and job creation. Its policies are designed to help reduce the trade deficit, ensure regular supplies to the domestic market, promote local value chains, strengthen the regional integration process and access to international markets, and promote competition. A top priority for trade in Senegal is political, technical and financial support for the African Continental Free Trade Agreement. There is need to support the private sector to transition to sustainable business across value chains. This will potentially be realised by regional hubs for secondary resources which could benefit from EU engagement and knowledge sharing.

Senegal is active in trade of various commodities. In 2010, the country's environmental goods and services sectors accounted for 4% of the total trade volume, and this share has steadily increased to 7% in 2016. Trade in environmental goods and services is limited to imports, where renewable energy technologies, water treatment technologies and waste management systems have accounted for the largest part of the imports in the period 2010-2013 while renewable energy technologies and cleaner / more resource efficient technologies and products have dominated in the period 2014-2016. The Emergent Senegal Plan, which came into effect in 2012, drives local investment in infrastructures for greening the country. This explains the upward trajectory of trade in environmental goods and services. The country's top export goods remain mineral fuels, precious metals, fish, inorganic chemicals and ores.

Existing awareness and capacities on circular economy in Senegal

Beyond policy, there are low national awareness levels, with the majority of businesses and industries not yet actively involved in green, sustainable or circular production activities. Industrial activities are currently characterised by intensive use of natural capital and carbon-intensive technologies, generating huge amounts of waste. The majority of consumers are still mostly unaware of the circular or green economy, as demonstrated by poor consumer waste management patterns. Senegal is, however, experiencing the first industrial initiatives recognising the advantages of a circular economy. These initiatives are mostly active in the field of waste management or recycling.

Civil society engagement is indispensable for a transition to the circular economy in Senegal. Developing a social movement is necessary as the engagement of the wider population is key to driving lasting change. End-consumer engagement creates a pull-strategy that drives market shifts. In Senegal, public awareness is spread via progressive artists using various media to engage the wider population. In Dakar, the use of street art is widespread and an accepted format of engaging public dialogue on improvements to city life and civic responsibility.

Existing and future economic, environmental and social impacts and benefits

The implementation of national policies and initiatives that are related to the circular economy have several positive economic, environmental and social impacts and benefits that include the creation of new business and employment opportunities, with employment impact that goes beyond just "creation" but also includes "substitution, elimination, transformation and redefinition". Increased local production that contributes to food security, and broader uptake of environmentally sound agricultural practices.

In this study, we have also undertaken a forward-looking assessment, where a macro-economic model was used to estimate the impact of a (limited) set of circular economy measures in the identified priority sectors Agri-food, plastics, construction, electrical and electronic equipment (EEE) products and E-waste and general waste. Overall, the circular measures assessed could lead to an increase in economic activity and create additional jobs by 2030.

- **Economic benefits:**
 - A 0.6% increase of GDP (+EUR 311m) compared to business as usual;
 - An improvement of the trade balance, through a reduction in imports worth EUR 100 m;

- Food loss reduction across the agricultural value chain and associated investments are the largest driver of the impacts found in our modelling assessment.
- **Social benefits:**
 - 8,200 additional jobs would be created compared to business as usual, which is equivalent to an increase of 0.15%;
 - If done in the right way, increased activities in waste collection and recycling could strengthen the economic position of (informal) waste workers, and attention for capacity building and training can ensure that these people will benefit from the CE transition as well.
 - The largest employment increases are found to occur in agriculture, education and health, construction and financial intermediation and business activities. The largest job loss occurs in the chemicals and metal sector, due to product substitutions.

Mapping of CE-related cooperation activities between the EU and Senegal

The sector-specific agreements between the EU and Senegal are lacking a clear focus on circular economy. While not incorporated into an institutional framework, circular economy has seen some emergence in the bilateral exchange between the EU and Senegal. The EU and Senegal have adopted a joint statement outlining possible areas for cooperation, formalised as the “Dakar Pathways to Advance Circular Economy, Green Industries and Jobs in West Africa”. A promising prospect for joint activities is the focus on circular economy activities in an institutional framework for development cooperation and DFI investments.

Despite overlapping with the selected focus areas of development programmes, such as those funded under the European Development Fund, circular economy does currently not play a primary role in the institutional framework of development cooperation in Senegal. However, in light of the recent bilateral exchange on circular economy, an integration of circular economy-related programmes like the upcoming Team Europe Initiative (TEI) on Green Economy in the programming 2021-2027, seems like a promising prospect for further joint activities.

Advancing circular economy-related activities of EU businesses and business associations within Senegal can drive the transition to a circular economy in Senegal. The development and improvement of platforms such as the Sustainable Business for Africa Platform and the International Platform on Sustainable Finance could particularly facilitate the access to finance, the cooperation between companies, as well as the exchange of circular economy-related knowledge.

Snapshot of Recommendations

Coordination and alignment between government departments

To support a circular transition, coordination and alignment between government departments is needed. Integration of federal, state and local role-players is key, particularly in complex sectors such as waste management.

Capacity building

In order to support local value chains, robust capacity building measures need to be implemented. Capacity building and skills development need to be focused on circular and green industries to develop local capacity in the necessary fields such as irrigation solutions for the agricultural sector, digital skills that will facilitate a shift to service models, and skills for the emergent eco-construction industry.

Digital transformation

New communities of users or citizens are being created via digital platforms, (re)developing circular economy practices: the sale of second-hand products, car sharing, and other uses related to collaborative economies, functionality, sharing, etc. These platforms may be territorially based, offering exchanges between neighbours or short circuits. The Association Zéro Déchet Sénégal site is a good example. This kind of initiative needs to be extended and supported.

EU - Senegal Cooperation

- The term circular economy must be generalised in all the sectors it encompasses, whether it be for the creation of green jobs, the improvement of waste management, the implementation of more responsible agricultural techniques, etc.
- Targeted policy dialogues that engage the private sector in Senegal, using chambers of commerce as a vehicle for embedding circular economy principles. The EU could play a role lobbying on legislative changes to address regulatory changes and needs. The enabling environment created by supportive policy and legislature can drive opportunities beyond concept to scalable implementation.
- Integrating circular economy principles into European development cooperation programmes. The newly signed development cooperation projects offer significant potential for the development of circular economy in Senegal, both in terms of green/circular job creation and the sustainable development of the country.
- The formulation of an Economic Partnership Agreement (EPA) between Senegal and the EU restricting the import of used materials such as electronic waste, clothing and plastics that contribute to the growing waste problem in Senegal and the establishment of preferential tariffs for trade in environmentally friendly goods and technologies should be encouraged.
- There is opportunity for the EU to engage on knowledge sharing and development of an EPR process that takes the local landscape into account.
- Partnerships between European and Senegalese universities must be established to facilitate the sharing of skills and knowledge.

Sector-specific recommendations

Agri-food

- Wide implementation of irrigation and efficient water management could increase crop yield and subsequently create more employment opportunities across the value chain.
- Pilot schemes in rural areas can be scaled to develop best practice for agriculture in Senegal: to preserve soil quality and organic matter and focus on promoting natural fertilisers and bio-pesticides.
- Development and implementation of agro-forestry techniques, where bilateral knowledge sharing can contribute to improved processes on both sides.
- Knowledge sharing can also support processing projects to minimise post-harvest food waste. Beneficiation to high-value processed products can add employment opportunities further down value chain.
- The sector needs to be bolstered by a robust capacity building drive that focuses on applying best practices such as the use of organic fertilisers, and integration of traditional and modern processing methods.

Chemical industry, plastics, construction

- The ban on single use plastics can open up market for renewable and re-usable alternatives. A coherent strategy for alternatives to single-use plastics needs to be developed to accompany the Anti-Plastics law that has recently come into effect.
- The development of eco-construction and the production of bio-sourced materials is conducive to innovation and new trades. The potential for green jobs in the construction sector is significant, however, capacity building and skills development is an absolute priority for the successful promotion and implementation of eco-construction.

Waste management, WEEE

- Support for the formalisation of actors on a technical and financial level must be set up. A large campaign should be conducted in the country to explain the advantages of formalisation. This includes access to funding, business support, and capacity building.
- Technical and financial support for acquisition of appropriate technologies for waste disposal and processing.

- Senegal's mining industry has the potential to work collaboratively with the secondary-resource sector to develop closed loop systems for these metals. Applying sound environmental and social practices in gold extraction, whether from mining or e-waste, together with traceability measures would help position the industry better.
- Using circular economy principles as a baseline, means that the sector could look beyond upstream activities to localised beneficiation as well.

The circular economy is a unique opportunity for Africa, but the concept and implementation need to be adapted to the reality of the continent. Senegal is confronted with a young population, booming urbanisation, a predominant informal sector, and an emerging middle class, who will consume more. Rapid urbanisation and the explosive growth of Dakar necessitates an approach that is regenerative, and an economy that supports both the growing population and the natural resources on which they depend. All of this needs to be linked to a core driver in developing local circular economy capacity, knowledge and expertise. Opportunities exist for the EU to support Senegal economy in its circular transition by considering localised challenges but also the numerous existing opportunities.

1 Introduction

1.1 This report

This report is one of eight ‘country reports’ to be produced as part of the study ‘Circular Economy in the Africa-EU Cooperation’¹. The general objective of this study is to provide a better understanding of the state of play of current and potential uptake of the circular economy in Africa. The study should also facilitate a better understanding of the potential impact of the transition to Circular Economy in the EU and Africa in terms of opportunities and trade-offs for Africa and highlight the role of EU-Africa cooperation in circular economy development in both continents.

This report analyses the state of play of circular economy activities in Senegal. It explains the potential economic, environmental and social impact of the transition to the circular economy in Senegal in terms of opportunities as well as trade-offs, and identifies policies and strategies to maximise the former and mitigate the latter. It also provides recommendations for a more effective and integrated EU approach for promoting the Circular Economy transition in Senegal, connecting the different levels of EU engagement including policy dialogues, development cooperation, trade and investments, innovation and research.

1.1.1 *Scope of circular economy activities and connection to the European agenda*

Circular Economy (CE) in this report is understood as an economic system which ultimately produces neither waste nor pollution by keeping products longer in use and by circulating materials at a high quality within the production system and, if possible, feeding them back into the biosphere to restore natural capital at the end of life. As such, the circular economy covers both economic aspects (e.g. value addition, job creation, GDP growth) as well as environmental aspects (focusing on materials and resources). In addition, it takes a full lifecycle perspective, including raw material extraction and processing, design & manufacturing, use & consumption, as well as end-of-use management to look at the potential for circularity throughout the value chain.

Although we acknowledge that the transition to a zero-emission energy system is related to the circular economy concept, this study addresses only material resources and not renewable energy deployment.

This report is developed in the context of the implementation of the European Green Deal² agenda, and notably of its international dimension. Elements developed in the Circular Economy Action Plan³, but also in other EU strategies such as the Farm to Fork Strategy⁴ or in EU Waste prevention and management policies⁵ are taken as guiding principles. For instance, priority sectors or policy instruments have been taken as inspiration while not neglecting the local contexts and dynamics of the chosen African countries. Connections between the African and European policy agendas are shown throughout the report and potential future links are included in the recommendations chapter.

¹ Country reports have been produced also for Nigeria, Ghana, Egypt, South Africa, Morocco, Rwanda and Kenya.

² European Commission (2020) [European Green Deal](#)

³ European Commission (2020) [EU Circular Economy Action Plan](#)

⁴ European Commission (2020) [Farm to Fork Strategy](#)

⁵ European Commission (2020) [EU Waste prevention and management policies](#)

1.1.2 Methodology

The report has been prepared by Trinomics B.V., adelphi and Cambridge Econometrics in close cooperation with TOMA-Now, through their Senegalese country experts and Association Zéro Déchet Sénégal, who have contributed local knowledge to the analysis across all sections of the report. In addition, the EU Delegation and the Federal Ministry of the Environment and Sustainable Development, Senegal has been consulted. Further interviewed stakeholders are listed in Annex A.

Desk research has been the basis for Chapter 1 and Chapter 4 and has also fed into Chapter 2. In addition, several international and national datasets have been analysed to be able to understand the status of the circular economy in Senegal (Chapter 2).

The modelling of impacts and benefits on Chapter 3 has been carried out using Framework for Modelling Economies and Sustainability (FRAMES)⁶. The modelling has followed three steps: 1) collecting the required data for each country; 2) build the model (i.e. developing a model solution for each country); and 3) design and implement the scenarios.

1.2 Reading guide

This report has been structured as follows:

- **Chapter 2** provides an overview of the status of the circular economy in Senegal analysing circular economy trends, the policy framework supporting circular economy activities, trade and investments in the circular economy, and existing awareness and capacity;
- **Chapter 3** estimates the economic, social and environmental impacts and benefits of the Circular economy in Senegal at present and for the future;
- **Chapter 4** studies cooperation between the EU and Senegal, by mapping circular economy-related cooperation activities between the two, and by exploring opportunities for expanding such;
- **Chapter 5** provides recommendations for a more effective and integrated EU approach to promoting the circular economy transition in Senegal, connecting all levels of the engagement including policy dialogues, development cooperation, trade and investments, innovation and research.
- **Chapter 6** summarises the main findings from earlier chapters.

⁶ FRAMES is a new Input-Output (IO) tool with E3 linkages, capturing both direct and indirect (supply chain) impacts from a shift towards a more circular economy. FRAMES is particularly suitable for those countries not represented in E3ME due to data limitations, while its key features are similar to E3ME.

2 Status of the circular economy in Senegal

Section 2.1 briefly summarises the place that the circular economy has in Senegal. Section 2.2 provides an overview of the economic trends that impact the current circular economy transition in Senegal in different life cycle stages. Specific sectors have been identified as priority sectors because of their important contribution to the national economy and potential role in circular economy, namely agriculture and food production, chemical industry and waste management, which are discussed in Section 2.3. Section 2.4 provides an overview on the current policy frameworks in Senegal. Section 2.5 shortly addresses Senegal's trade and investments situation, as these can influence CE developments. Finally, Section 2.6 details the awareness and capacities of CE in Senegal.

2.1 Senegal and the circular economy

Senegal is located in the most Western part of Africa, bordered by Guinea-Bissau, Guinea, Mali and Mauritania, and surrounding Gambia. It covers 196,530 km²⁷ and holds a total population of 16,209,125 measured in 2019⁸, of which a quarter lives in the region of Dakar⁹. The country's politics follow a presidential democracy and belong to the few most stable African countries without any coup and only peaceful political transitions since its independency in 1960.

Senegal ranks as the 9th most important African export partner for the EU and as the EU's 24th African import partner. In 2018, around 15% of Senegal's exports were destined for the EU while 38% of Senegal's imports originated from the EU. The share of exports from Senegal to the EU has been stable in the last decade while the share of EU imports to Senegal have decreased (they were 44% in 2010).¹⁰ The circular economy has not been a focus area yet in trade and investment. Also, measurements on the import of environmental goods and services, which amounted 7% in 2017¹¹, dominated by renewable energy technologies and cleaner / more resource efficient technologies and products, point into a rather low activity in the sustainability and CE field.

The economic structure of Senegal remained fairly constant in the past two decades, with the largest contribution coming from the service sector, the second largest from industry and the smallest from agriculture. Even though the GDP contribution from agriculture is not very large (19%), the labour market does depend on this sector which employs 56,7% of the total population¹². The large service and growing industrial sectors offering means to decrease this dependency and, especially through industrial, mechanical but also circular processes, to increase the productivity in the agricultural sector tackling the increased risk of food scarcity.

In its Emerging Senegal Plan (PES), the country expresses its development objectives and recognises the green economy as means to reach basic social needs and a sustainable development. With a new national policy, CE has recently been added to the policy agenda – making Senegal one of the African CE frontrunners. In addition to this, together with the EU Senegal has adopted a joint statement outlining possible areas of cooperation to advance CE, green industries and jobs in West Africa. These two main

⁷ Countryreports.org (2020). Senegal Geography.

⁸ PopulationData.net (2019). Senegal.

⁹ World Bank (2020). The World bank in Senegal.

¹⁰ UN Comtrade.

¹¹ OECD - Trade in Environmental goods and services.

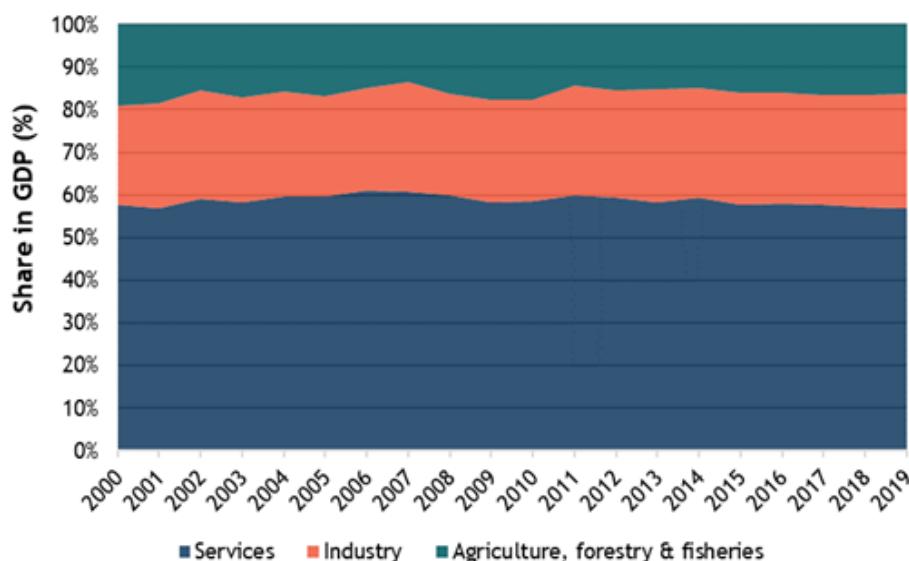
¹² UNEP (2014). Green Economy Assessment Study - Senegal.

high-level initiatives serve as steppingstone to further expand and integrate CE in top-down and bottom-up initiatives in different fields.

2.2 Economic structure, resource consumption and exports of Senegal

The macro-economic structure of Senegal has remained fairly constant in the past two decades, although the contribution of services has declined slightly in favour of industry (Figure 2-1). The share of the primary sector in GDP increased between 2014 and 2019, rising from 13.4% in 2014 to 15.2% in 2019.

Figure 2-1 Contribution of the primary sector, industry and services to the Senegalese economy

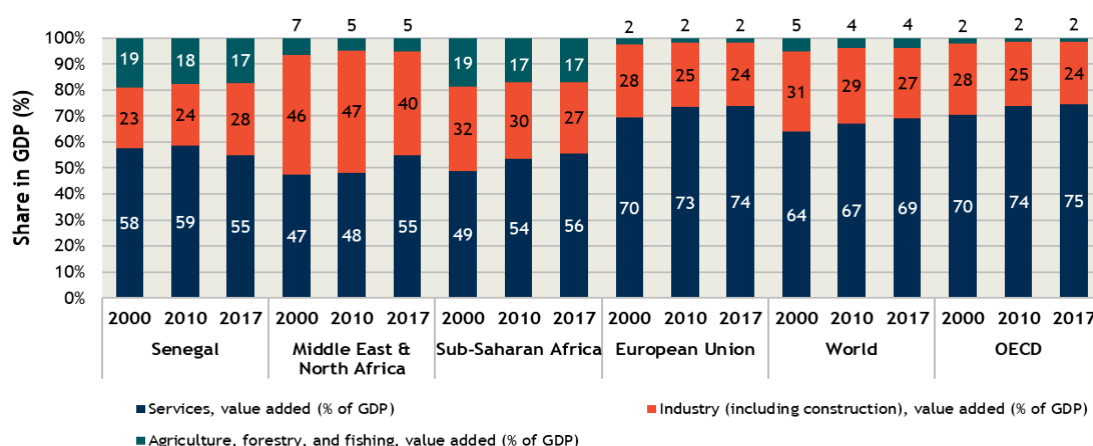


Source: World Bank - World Development Indicators

Compared to other sectors, the tertiary sector has a significant share in Senegal's GDP. This is linked to the good development of the financial and insurance services (+7.3% GDP growth in 2014-2018), trade (+6.2%), transport (+7.1%) and real estate (+6.6%) sub-sectors. Furthermore, in the transport sub-sector, activity benefited from the expansion of the road network, the renewal of the vehicle fleet and the strengthening of the competitiveness of the autonomous port of Dakar. The dynamism of activities in the secondary sector can be explained, in particular, by the good performance of the sub-sectors of extractive activities, agro-food and chemical products, electricity and construction. Mining activities have increased thanks to phosphate production. However, the informal sector accounted for more than 60% of GDP in 2014¹³. The importance of this sector prevents an accurate assessment of the country's economic potential. The contribution of the primary sector (agriculture, forestry & fisheries) is relatively high (17%) compared to the global average (4%) or the European Union (2%) (Figure 2-2).

¹³ Agence Nationale de la Statistique et de la Demographie (2011). Enquête Nationale Sur Le Secteur Informel Au Sénégal.

Figure 2-2 Comparison economic structure of Senegal with regional averages

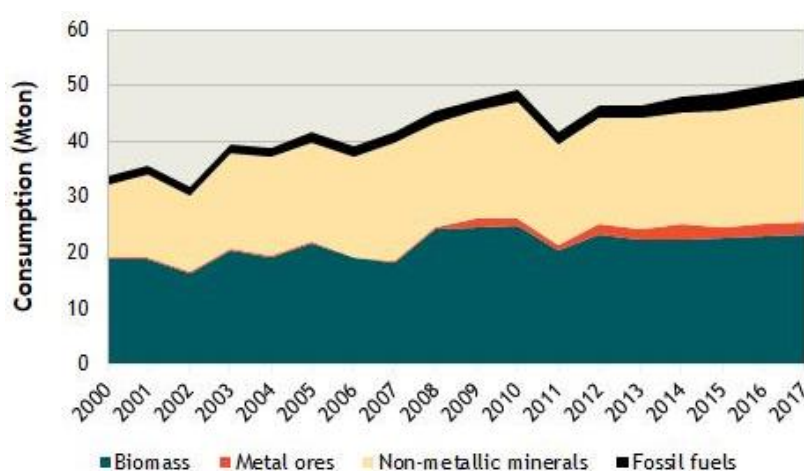


Source: World Bank - World Development Indicators

Similar to the GDP development over the last two decades, the overall consumption levels have been rather volatile, but with an increasing trend. Where the GDP reached its lowest point in 2011 with 1% (Figure C-4, Annex C), one can also note a considerable drop in the resource consumption (Figure 2-3). Senegal's economic growth remains closely connected to its resource consumption, which implies that no decoupling has taken place yet. Following deteriorating economic management marking the period between 2005 and 2012, a new administration with improved macro-economic policies, implemented critical infrastructural investment and initiated several reforms aimed at enhancing overall economic governance, the business environment and performance of specific sectors (such as liberalising the groundnut market, opening up the energy sector to independent power producers and the cement sector to new private sector players, restructuring the Chemical Industries of Senegal, and liquidating a loss-making semi-public airline).¹⁴

Along with the overall growth of the population and the economy, since 2000, Senegal's domestic resource consumption has grown by 50%. Its two dominant shares are biomass and non-metallic minerals while the share of fossil fuels has slightly increased since 2011 and metal ores, emerged in 2008, also shows a slightly growing trend.

Figure 2-3 Overview of domestic material consumption by type in Senegal for the period 2000-2017

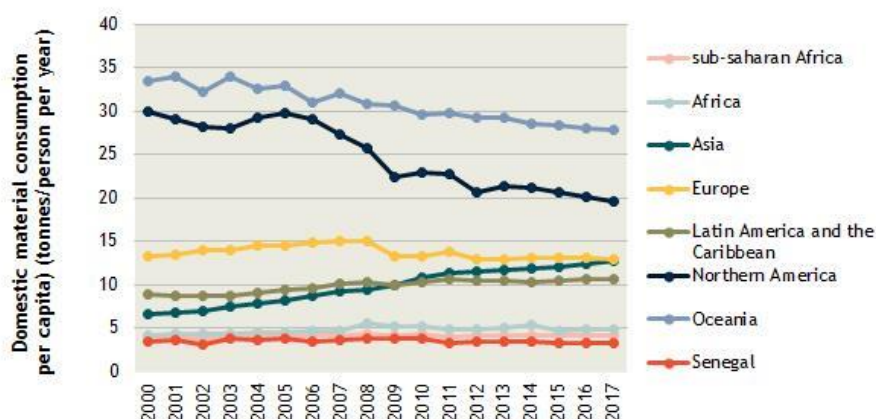


Source: SDG Indicators - Indicator 12.2.1 Domestic Material Consumption by type

¹⁴ World Bank Group (2018). Systematic Country Diagnostic of Senegal.

Resource consumption per capita in Senegal remained relatively low and constant compared to other global regions between 2000-2017. Comparing it to the sub-Saharan average, the consumption trend and progress is very similar, but still slightly lower. Compared to the EU, the average inhabitant of Senegal only consumed a quarter of the European average.

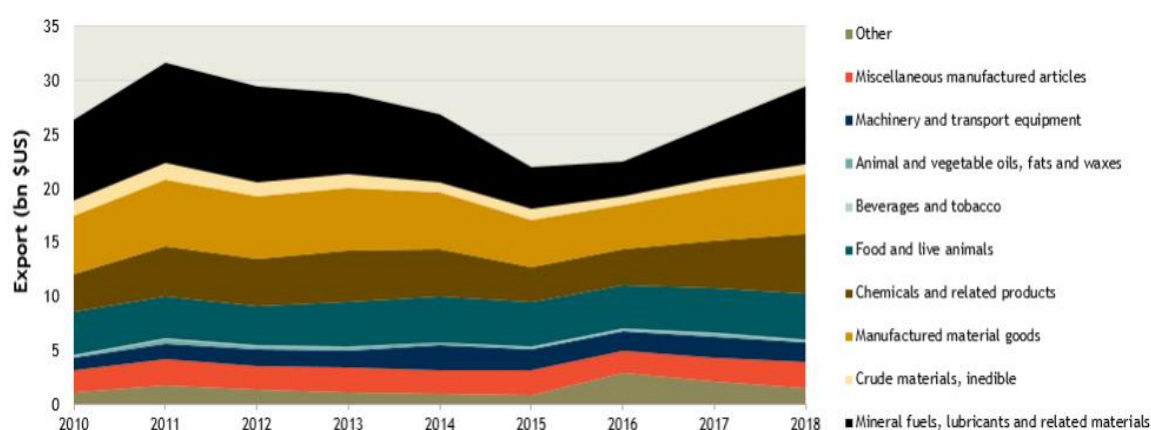
Figure 2-4 Material consumption per capita in Senegal compared to regional averages



Source: SDG Indicators - Indicator 12.2.1 Domestic Material Consumption per capita

When looking at Senegal's exports (Figure 2-5) one can see that chemicals, manufactured material goods together with a growing share of machinery and transport equipment and a constant share of food and agricultural products dominate.

Figure 2-5 The share of different products in total Senegalese exports in the period 2010-2018



Source: UN Comtrade

Economic impact of COVID-19

Senegal and Africa in general, are highly dependent on external markets and already suffer from a lack of private sector investment, Covid-19 will exacerbate this situation further. The Covid-19 pandemic will have far-reaching economic impacts on Senegal, with growth rates for 2020 being adjusted down to 3,1%.¹⁵ Considering the expected socio-economic impacts, the government has also adopted an economic and social resilience programme to fight the pandemic at a total cost of USD 2 Billion.¹⁶

¹⁵ Fitch Solutions (2020). Senegalese Growth to slow sharply in 2020.

¹⁶ Deloitte (2020). How Senegal remained attractive after the COVID-19 pandemic.

2.3 Circular economy-related trends in key sectors

In Senegal, industrial production is focused on the manufacturing sector, with the biggest segments being food production (41%), chemicals (17%) and construction materials (16%).¹⁷ Accordingly, the most promising sectors in Senegal for CE are:

- agri-food (including biomass extraction, food production and consumption and elements regarding food waste);
- the chemical industry, including fertiliser production, plastics and construction (including plastics recycling);
- waste management (including EPR/DRS and e-waste);
- We also identify opportunities in other sectors, such as transport.

The selection of these sectors to be covered under the study is based on the following rationale:

- Relatively high contribution of these sectors to the national GDP and percentage of labour force;
- The existence of policies and strategies that support transition to circular economy in these sectors;
- Prioritisation of these sectors by PES and Dakar Pathways to Advance Circular Economy, Green Industries and Jobs in West Africa;
- Identified in the National Determined Contribution of Senegal (CDN)¹⁸ as a sector that gives priority to mitigation of climate change impacts: **agriculture, fishing, forestry, transport, waste management, energy and industry.**
- Interlinking with the priorities of the EU's circular economy action plan;
- Identification of opportunities in these sectors that contribute to the achievement of CE measures.

2.3.1 Agri-food

Natural resources form the basis of economic activities, on which at least 60% of the population directly depend, including many poor rural populations who derive food, fuel, building materials, animal fodder, medicinal plants and income from them¹⁹. Natural resources contribute to food security, employment, revenue generation and the national economy. Soil and water resources are the basis of agricultural activities, that employs 56,7%²⁰ of the total population.

The most important resource types extracted in Senegal are biomass and non-metallic minerals²¹ (Figure 2-6). Whereas the total level of biomass production has grown only slightly over the last two decades, the extraction and production of non-metallic minerals for agricultural and industrial purposes has grown steadily, with clays and phosphate rock used in mineral fertiliser being the most important products.²² The increase in phosphate production is the result of the revival of Chemical Industries of Senegal (ICS) thanks to the investments undertaken following the arrival of the Indonesian partner, Indorama.

¹⁷ Tradingeconomics.com (2020). Senegal Industrial Production Mom | 2008-2020 Data | 2021-2022 Forecast | Historical.

¹⁸ MINISTERE DE L'ENVIRONNEMENT ET DU DEVELOPPEMENT DURABLE, 2019. *RAPPORT DE LA CONTRIBUTION DETERMINEE AU NIVEAU NATIONAL DU SENEGAL.*

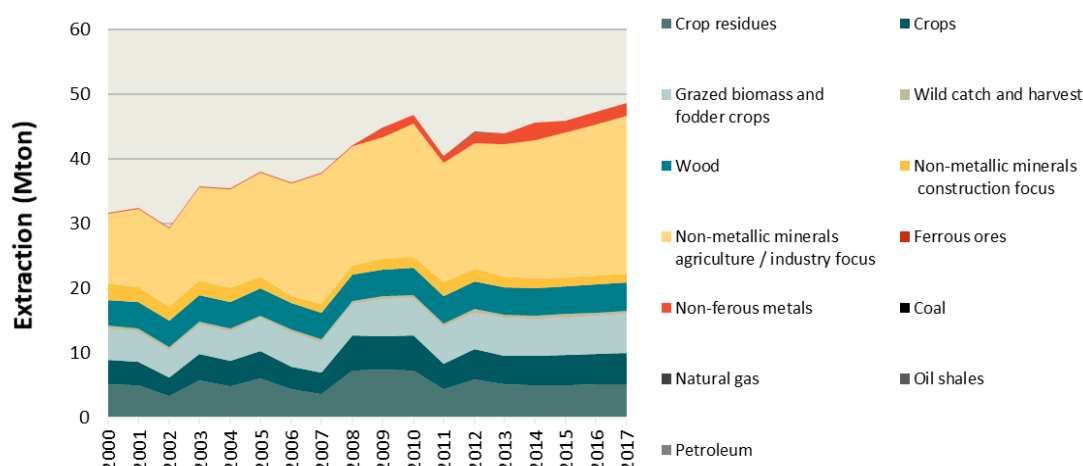
¹⁹ UNEP (2014). Green Economy Assessment Study - Senegal.

²⁰ *Ibid.*

²¹ ITIE Senegal (2017). Initiative pour la Transparence dans les Industries Extractives du Senegal.

²² US Geological Survey (2015). The Mineral Industries of The Gambia, Guinea-Bissau, and Senegal in 2012.

Figure 2-6 Resource extraction in Senegal by type for the period 2000-2017*



Source: UN SDG Indicator 12.2 Domestic Resource Extraction

*Special note: There is an inconsistency between the UN resource extraction data and data on mineral production from the US Geological Survey (USGS), with the UN figures overestimating resource extraction. The UN SDG data is based on a reference year, extrapolating the following years. In the USGS figures, total production of non-metallic minerals lies around 6.7 Mtons in 2012, compared to 21.5 in the UN data. For consistency and completeness, the UN data is reflected. Focus should be on the type and spread amongst resources extracted, rather than final amounts, given limitations on data availability.

Food production and the agricultural sector

Crops are the dominant material group for domestic material extraction in Senegal. However, the sector's productivity is low, covering on average only 52% of food needs. The low agricultural production and high population growth (2.6%) places Senegal in a structural food crisis. Food security is a high national priority, identified in the PSE. In addition, the major challenges to be met, as outlined in the sector policy letter²³, in the agricultural sector include minimising post-harvest losses, developing sustainable mechanisation of production systems with the private sector and maintaining efficient agricultural research for the generation, dissemination and adoption of technologies and innovations. Cooperation with the EU to strengthen capacities for adoption of technologies and innovations is pertinent to the latter.

Rice is the staple of the Senegalese diet in terms of its contribution to daily caloric needs, it accounts for half of Senegal's cereal consumption (51% in 2013/2014), however, Senegal only produces a quarter of its domestic consumption need. Rising prices of inputs and agricultural commodities, and falling prices of local products, including a deterioration in the terms of trade, expose the Senegalese to food insecurity. Households in the north of the country are repeatedly exposed to environmental shocks such as extreme drought and lack the economic resilience to recover.²⁴ Senegal's consumption patterns emphasise the need for interventions relating to food security and nutrition. The dependence on imported rice in particular, needs to be broken and sustainable local value chains developed. The sector policy letter expresses the strategic aim to achieve food self-sufficiency by 2020. The Covid-19 pandemic, and the ongoing climate impacts on production have led to this goal not being met. Efforts already undertaken within the framework of Programme d'Accélération de la Cadence de l'Agriculture Sénégalaise (PRACAS) will be continued to increase rice and onion production, optimise the performance of the groundnut sector, develop the horticultural sector and revive cotton production.²⁵

²³ MINISTÈRE DE L'AGRICULTURE ET DE L'EQUIPEMENT RURA: Lettre de Politique Sectorielle de Développement de l'Agriculture (LPSDA) 2019 - 2023.

²⁴ Docs.wfp.org (2018). Rapid Analysis Of Food Security In Northern Senegal.

²⁵ MINISTÈRE DE L'AGRICULTURE ET DE L'EQUIPEMENT RURAL (2019) Lettre de Politique Sectorielle de Développement de l'Agriculture (LPSDA) 2019 - 2023.

Agriculture is mainly directed by family farms practising subsistence agriculture. About 75% of the Senegalese population²⁶ is highly dependent on rain-fed agriculture with only 2% of agricultural land irrigated.²⁷ This makes the sector vulnerable – implementation of irrigation and efficient water management could increase crop yield and create more employment opportunities across the value chain. Additionally, the need for mechanisation is significant, as there is a short timeframe between harvest and re-sowing.²⁸ Support for mechanised equipment can increase crop yields and support more efficient harvesting practices. However, the threat of replacing smallholder farming by large-scale linear farming practices using monocultures, high levels of mineral fertilisers, pesticides and herbicides is why circular economy principles should be adopted for small scale farmers, using the opportunity to establish food security by means of circular practices. Senegal has the opportunity to blaze a path for decentralised, small-scale, urban and rural food production using regenerative agricultural practices.

Optimising the performance of the groundnut sector indicates opportunities across the value chain, including in processing, packaging and storage, which will increase the competitiveness of the sector both locally and with the possibilities of increased trade. The focus is on the promotion of agricultural and rural entrepreneurship based on the coexistence of agribusiness and family farming, which takes the environmental impact of activities into account. For processing, it will take into account all aspects related to products and by-products, both processed by the agri-food industry and by traditional means. It should be based on the results of research in the agri-food industry, where EU expertise in mechanised processing can be leveraged for training and support for players in the fields of technology for the transformation of quality plant products.

The development of the agricultural sector remains fragile and faces major constraints related to infrastructure, low production, and climate impacts. Below is an overview of selected initiatives and programmes addressing these constraints (Table 2-1).

Table 2-1 Food production and agricultural programmes and initiatives

Challenge	Focus	Detail	Outcomes
Inadequate basic infrastructure	Irrigation	Bonergie Irrigation (Special purpose vehicle)²⁹: Produce and implement solar powered irrigation systems (SPIS) across rural Senegal. Replace diesel pumps or provide small-scale farmers with first time access to irrigation. Choice of unit tailored to individual farmers' needs with water management training.	Launched 2019, ongoing
Low production yields	Gender equality, female empowerment for land access	Flower of Hope³⁰: Innovative production system for resource-poor women: land, inputs, professional training and market access to become self-employed agricultural entrepreneurs. Environmentally friendly hibiscus cultivation for herbal tea markets. Includes food security crops to reduce business risk.	Inclusive business model: Access to land, markets for women. Microfinance for sustainable livelihoods. Design out waste: Promotion of post-harvest drying and processing techniques for waste minimisation Keep products and materials in use: Promote ecologically sound agricultural practices that close the loop Regenerate natural systems: Ensure sound harvesting techniques and soil enrichment

²⁶ Green Economy Coalition (2018). The Green Economy Barometer 2018 Senegal.

²⁷ *ibid.*

²⁸ ALIMENTERRE (2020). Le Senegal Peut Nourrir Le Senegal.

²⁹ Bonergie.com. 2020. Home - Bonergie.

³⁰ 2020. Flower Of Hope. [online] SEED - Promoting Entrepreneurship for Sustainable Development.

Agricultural waste

A concerted focus is needed on waste to value, benefiting the organic waste generated. Part of the process involves understanding where product spoilage takes place – through over fertilisation, early harvesting, drying or storage, and planning interventions accordingly.

In the context of urban growth and ecological requirements, agriculture can be one of the solutions to the city's waste management problem. Recovery of organic matter from commercial and subsistence agriculture can be used as feedstock for composting and other initiatives that target beneficiation of organic wastes. A multitude of organic materials with different origins and characteristics are available as feedstock for fertilisers as well as other applications, depending on production methods (see Table 2-2)³¹. Beneficiation of organic waste in Senegal is the mainstream in peri-urban gardening, with reported application noted in research from 2004. The pressing need to reclaim nutrients lost to urban areas necessitates the optimisation of composting initiatives in peri-urban areas (such as in Thiès, as well as in Dakar). Food production generally occurs outside the urban centres, however the organic waste is generated in urban areas and rarely returned to the zones of production, thus raising the nutrient deficit.³²

Table 2-2 Circular agricultural waste treatment and application³³

Topic	Source	Current use/application
Manure	<ul style="list-style-type: none"> Horse manure produced in equestrian centres or Thiours. Poultry manure produced by professional breeders and family farms. 	<ul style="list-style-type: none"> Manure mixed with rice or groundnut straw, serves as "mattress" for horses. Sheep and cow manure: composite manure mixed with straw; sold in markets. Slaughterhouse waste slurry crushed and mixed into powder. Used by market gardeners.
Fish waste	<ul style="list-style-type: none"> Fishing wharfs Processing sites 	<ul style="list-style-type: none"> Afric Azote, also known as Pisano, collects carcasses or unsold fish to manufacture fishmeal.
Peanut dust	<ul style="list-style-type: none"> Peanut processing. Husks turned to dust by mechanical husking process. 	<ul style="list-style-type: none"> Market gardeners; use declining due to lack of availability.
Sludge from wastewater treatment	<ul style="list-style-type: none"> ONAS14 is main producer in Dakar through wastewater treatment plants it manages. 	<ul style="list-style-type: none"> Formerly used directly in market gardening for irrigation, raw wastewater is now prohibited. Collected and sent to treatment plants.
Compost	Domestic compost	
Biofuel initiatives (pilot projects)	<ul style="list-style-type: none"> Jatropha seedlings Return to Agriculture program. 	<ul style="list-style-type: none"> Revitalise rural economy by giving small-scale farmers jatropha seedlings. Initiative to boost biofuels segment. Refined oil used as biodiesel for vehicles and power generation.
	<ul style="list-style-type: none"> Sugarcane 	<ul style="list-style-type: none"> Ethanol as alternative energy source. Compagnie Sucrière Senegalaise developed pilot project using sugar-cane based resources to produce ethanol for power production.

³¹ Sidy, T. Zelem, M. (2018). Environmental And Economic Recovery Of Organic "Waste" In Peri-Urban Market Gardening In Dakar, Senegal.

³² McClintock, N., 2020. Women In Senegalese Periurban Agriculture: The Case Of Touba Peycouck.

³³ Sidy, T. Zelem, M. (2018). Environmental And Economic Recovery Of Organic "Waste" In Peri-Urban Market Gardening In Dakar, Senegal.

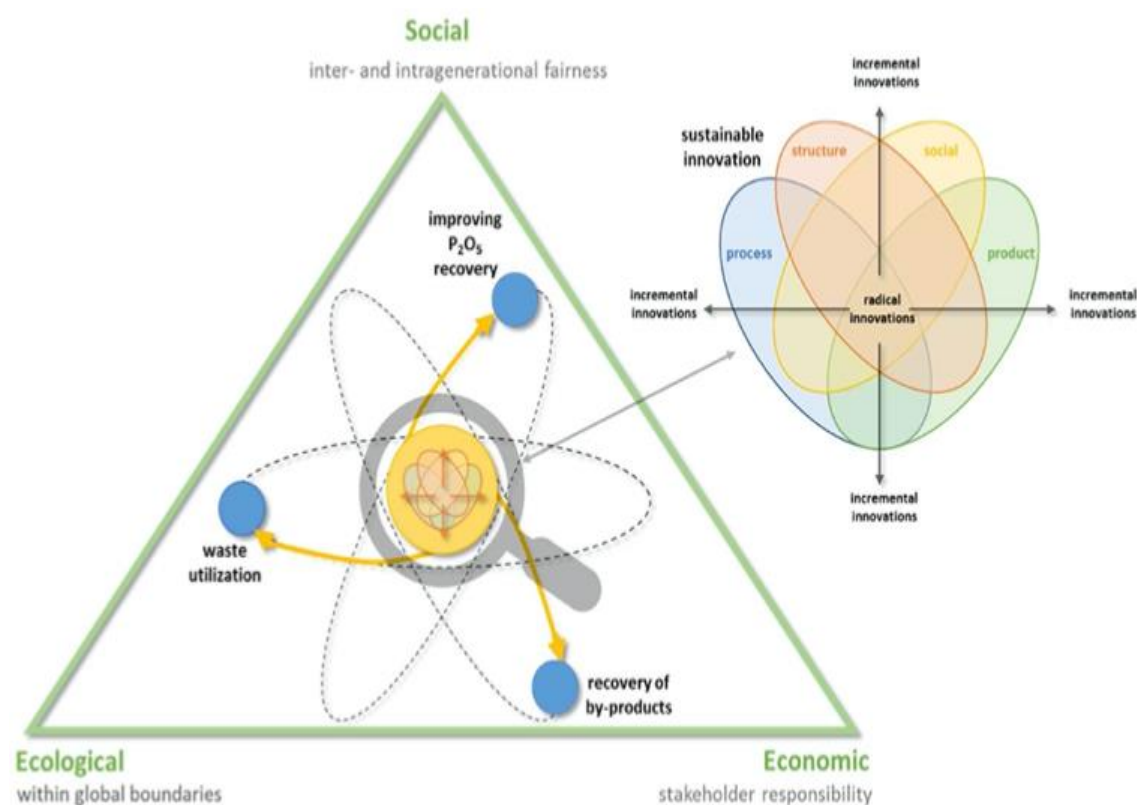
While climate impacts need to be tackled at the global and regional levels, the Senegalese government also needs to take measures to improve land management, consolidate agricultural outreach services and facilitate producers' access to markets and essential inputs. Government policies, interventions and initiatives are discussed in Section 2.4 'Policy Framework supporting Circular Economy'.

2.3.2 The chemical industry, plastics and construction

Chemical production: Phosphate

Opportunities for EU cooperation in the phosphate and agricultural production phases are focused primarily on the need to improve knowledge and capacities to improve practices in these sectors. It has been suggested by Geissler et al.³⁴ that radical multidimensional innovation will be key to adopt circular principles in this sector and improve phosphate recovery through utilisation of waste and recovery of by-products (see Figure 2-7). Their work explores looking beyond traditional supply chain optimisation to innovations around these key areas.

Figure 2-7 Phosphate Rock Mining-Innovation Nexus of sustainable phosphorus management³⁵



Source: Steiner, G. (2017)

Senegal has extensive reserves of high-quality phosphate ore; the phosphate beds are part of a very extensive phosphate-bearing area in northeast of Dakar. Industries Chimiques du Sénégal (ICS)³⁶ is the main producer of fertiliser in Senegal, which is exported to mainly neighbouring countries.³⁷ Merchant grade phosphoric acid is transported by rail cars to the seaside for export or to the fertiliser plant to produce Diammonium phosphate (DAP) or nitrogen, phosphorus, and potassium (NPK) blends. DAP is the

³⁴ Geissler, Bernhard & Hermann, Ludwig & Mew, Michael & Steiner, Gerald (2018). Striving Toward a Circular Economy for Phosphorus: The Role of Phosphate Rock Mining.

³⁵ Steiner, G. (2017). Unlock Hidden Innovation Potentials: Uncertainty, Risk, & Opportunity Costs.

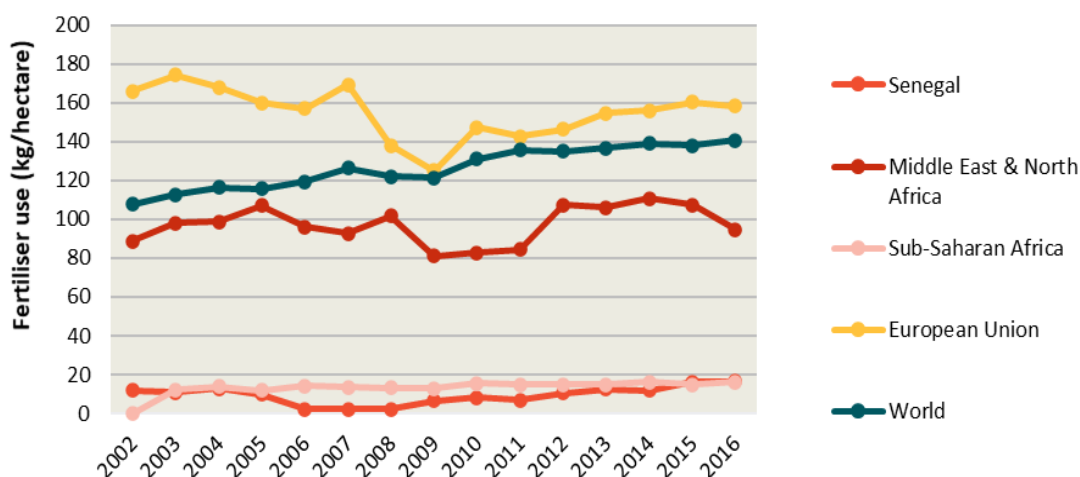
³⁶ Indorama.com (2020). INDUSTRIES CHIMIQUES DU SENEGAL.

³⁷ Trendeconomy.com (2020). Senegal | Imports And Exports | World | Mineral Or Chemical Fertilisers, Nitrogenous | Netweight (Kg); Quantity And Value (US\$) | 2008 - 2019.

world's most widely used phosphorus fertiliser, produced using ammonia and phosphoric acid, while various NPK blends are made using ammonia/urea, phosphoric acid, and potash.³⁸

While Senegal produces fertilisers locally, Figure 2-8 indicates that fertiliser use and application intensity in Senegal is still very low compared to the rest of the world, remaining relatively constant over the period 2002-2016, averaging around 9 kg/ha. This is similar to the Sub-Saharan average of 13 kg/ha, but only 7% of the world average and 6% of the average use in the European Union. Across Sub-Saharan Africa cost and access are cited as the predominant reason for low fertiliser application³⁹.

Figure 2-8 Fertiliser use intensity in Senegal compared to regional averages



Source: World Bank - World Development Indicators

Plastics industry

Senegal's plastics industry is small — there are only three registered plastics suppliers in Senegal.⁴⁰ The registered suppliers are distributors and importers, with limited local production. Local production includes everyday single-use plastic items such as sachets d'eau and Touba coffee cups.⁴¹ There is an opportunity for circular solutions to address Senegal's single-use plastic problem. A ban on single-use plastics was partially implemented in April 2020. Due to Covid-19 and concerns regarding hygiene, the ban does not yet currently extend to all single use plastics. It is too early to gauge impact given implementation has been delayed due to Covid-19. Impacts from this will have to be carefully monitored and analysed. It is envisioned that the ban on single use plastics could serve to develop markets for renewable and re-usable alternatives. Upcoming planned initiatives such as PROMOGED (see section 2.2.6) will act as a catalyst for the plastics recycling and beneficiation sector.

Private sector players can use this opportunity to establish themselves as local producers of well-managed, designed for next-use plastics that include recycled content. Local producers can also form industry-led Producer Responsibility Organisations to drive the proposed mandatory EPR for plastics.

The industrial sector's demand for processed plastic waste (shredded, granulated and powdered) varies on average from 5 to 50 tons/month.⁴² The local supply of such products is almost non-existent, with the

³⁸ Indorama.com (2020). INDUSTRIES CHIMIQUES DU SENEGAL.

³⁹ Policy Center for the New South. 2020. Fertilizer Use In Africa: A Price Issue.

⁴⁰ Plastic1.com (2020). Plastic Suppliers In Senegal.

⁴¹ Simpa.sn (2020). Nos Produits | SIMPA.

⁴² PS-EAU (2020). The Recycling Sector In Senegal For The Metal And Plastic Sectors.

exception of the pre-treatment centre in Thiès (70 km from Dakar) producing 1.5 to 2 tons/month of sorted, washed and crushed plastic waste.⁴³ ProPlast is a key role-player in the plastics recycling sector. The company recycles polyethylene (PE), polyethylene terephthalate (PET), and polypropylene (PP) collected from businesses and households across Dakar. The secondary raw materials are exported to The Gambia, Mauritania, Mali, Spain, the Netherlands and France. Some materials are beneficiated locally and sold on their e-commerce platform.⁴⁴

Plastics recycling

Senegal's plastics industry is focused on the end-of-life stage of the product's lifecycle. The plastics recycling ecosystem is developing in Senegal, however there is currently no value chain associated with waste recovery⁴⁵. Senegal currently has the capacity to treat only 10% of the plastic waste produced.⁴⁶ There are about 40 plastic processing companies in Senegal, concentrated in the Dakar region.⁴⁷

Waste and resource management needs to be applied across supply chains. An example of this is Société des Brasseries de l'Ouest Africain (SoBOA). SoBOA activities are very resource intensive. Four years ago, they invested EUR 2 million to start a more resource efficient business model, with immediate effects in one year: a 29% reduction in water consumption and a 23% decrease in energy consumption. They have also started investing in waste collection, separation and recycling for their bottles. The main challenge remains to collect the bottles littered by consumers. Awareness on the effects of plastic pollution is key to increase collection numbers with both public support and the (informal) waste collection sector.⁴⁸ This, coupled with a value associated with the material, should help increase the number of bottles collected.

Construction and industry

In 2015, Senegal consumed 3.1 Mtons of cement and this is expected to grow to 3.8 Mtons in 2020.⁴⁹ The rapid growing urbanisation of the country necessitates the inclusion of circular practices in construction to minimise climate impact from GHG emissions. Cement consumption in Senegal is growing, although with a relative consumption of only 0.21 tons/capita in 2015,⁵⁰ Senegal's relative cement consumption is less than 40% of the world average. Senegal's steel consumption has grown considerably (+144%) between 2008 and 2017, and per capita steel consumption has grown substantially (+87%) during this period as well (Figure 2-9), mainly because of economic growth.

⁴³ *ibid.*

⁴⁴ Proplast-industrie.sn (2020). Services & Solutions Proplast Industrie.

⁴⁵ *ibid.*

⁴⁶ WATHI (2020). Interview With Pod Estelle Ndour.

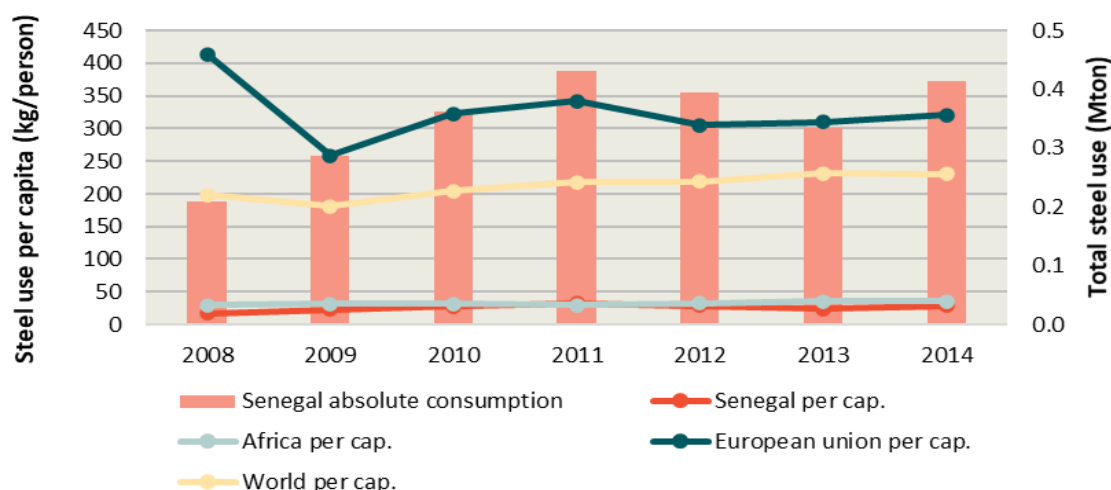
⁴⁷ PS-EAU (2002). The Recycling Sector In Senegal For The Metal And Plastic Sectors.

⁴⁸ OUDNI (2019). RAPPORT DE LA CONFÉRENCE REGIONALE DE HAUT NIVEAU Economie circulaire, industries vertes et emplois en Afrique de l'Ouest, Dakar.

⁴⁹ World Bank Group (2017). Use of Alternative Fuels in the Cement Sector in Senegal: Opportunities, Challenges and Solutions.

⁵⁰ *ibid.*

Figure 2-9 Consumption of finished steel products per capita in Senegal



Source: World Steel Association (2018) World steel in figures 2018⁵¹

The construction sector has experienced rapid growth in recent years, expanding by 7.0% in 2019, as the government has boosted investment into improving the country's energy, rail and road infrastructure.

Eco-construction

A large project that will impact the urban landscape of Dakar is '*City of Diamniadio*', the envisioned future city, just outside of Dakar, that aims to be completed in 2035. The future city will be a hub for manufacturing and industrial development. Of note is the Eco-pavilion built using compressed earth bricks. The site will demonstrate various earth-typha materials. It was designed as part of technology transfer project for production of typha-based building materials in Senegal, funded by GEF and UNDP, and implemented at same time and under the same coordination as the 'Programme for the Reduction of Greenhouse Gas Emissions through Energy Efficiency in the Building Sector in Senegal'. The latter is financed by the same donors. The mainstreaming of eco-construction materials at such large-scale constructions indicates a positive trend for embracing CE practices in the construction sector.

Senegal is also using innovation in traditional building methods that are renewable, nature-based and accessible to all. *Worofila Architecture*, for example, builds with raw soil in the form of compressed earth bricks (CEB), a merging of modern and traditional methods that highlight opportunities for nature-based solutions in the construction industry. In terms of large-scale production, this method is being used in construction of the express train stations, and the Diamniadio eco-pavilion. CEB uses a mixture of earth that is sometimes stabilised with a cement-like binder. It is composed of dry elements (sand, earth and cement) very slightly moistened and then compressed. Clay acts as the binding agent. Drying is done under tarpaulin, out of direct sunlight and watered regularly. Soil can be combined with vegetable fibers, such as typha, to reinforce its insulating character⁵². In other parts of Africa, CEB have also included construction waste as an input material.

The development of eco-construction and production of bio-sourced materials is conducive to innovation and new trades. The construction of the eco-pavilion is an extension of four years of R&D. It demonstrates application of research results on materials and associated building systems. On completion, it will also serve as a training space to transfer skills and knowledge of application. The potential for green and

⁵¹ World Steel Association (2018). STEEL STATISTICAL YEARBOOK.

⁵² construction21.org (2020). Construction With Raw Soil In Senegal - Construction21.

circular jobs in the construction sector is significant, however capacity building and skills development is a priority for successful promotion and implementation. The industry will also benefit from a conducive regulatory framework that makes allowance for recovery of demolition and construction waste (e.g. revising building codes that do not allow recovery due to safety and traceability issues). This goes towards establishing of standards leading to the safe use and traceability of secondary building materials. This would support the recycling and reuse of demolition waste, with a positive contribution to job creation.

Special Economic Zones

The government has made Special Economic Zones (SEZs) a pillar of its strategy to achieve the structural transformation of the economy. Areas of focus include development of agri-business, information and communication technologies, tourism, medical services, manufacturing and service industries⁵³. Industrial hubs offer opportunities for collaboration and support.

The Diamniadio Park was opened in 2018 and is currently in operation. It was co-developed by Senegal and Mauritius with a Joint Development Agreement, signed in 2017. A Senegalese-Mauritian joint venture, *Société des Infrastructures d'Affaires Atlantique* (SIAA), was set up in Senegal, establishing Mauritius Africa Funds as the majority shareholder with 51% of shares⁵⁴. The site will produce garments, PVC-pipes, food packaging, magnetic e-cards and electric bicycles. It now has 7 operational investors. The Government of Senegal invested USD 44 Million in Phase I of the Park. China has promised to invest USD 100 Million for Phase 2. The Park is seen as an immense employment opportunity.

Based on the types of companies the Park is aiming to attract, there is an opportunity to include principles of circular economy and eco-industry parks such as an industrial symbiosis program. However, the Park management as well as tenants need to understand the value that such an approach brings.

2.3.3 Waste management

Waste generation and treatment

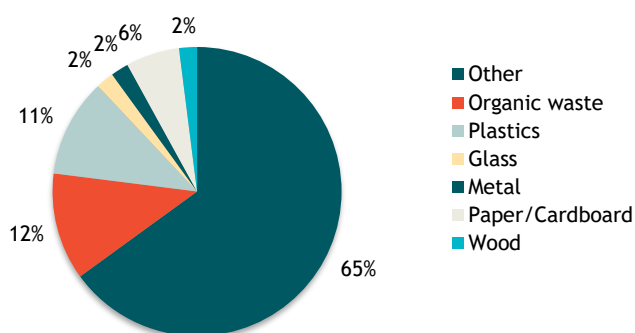
Waste characterisation for Senegal⁵⁵ was done by season (dry/wet) with negligible differences in characterisation. The wet season data is shown in Figure 2-10. The overall daily production of household waste at national level is 6,804 tons/day, while in the dry season it stands at 6,225 tons/day.⁵⁶

⁵³ Chinafrica.cn (2020). Zoning In On Investment- Chinafrica.

⁵⁴ Rogers Capital (2020). Senegal & Mauritius | Building A Two-Way Street | Rogers Capital.

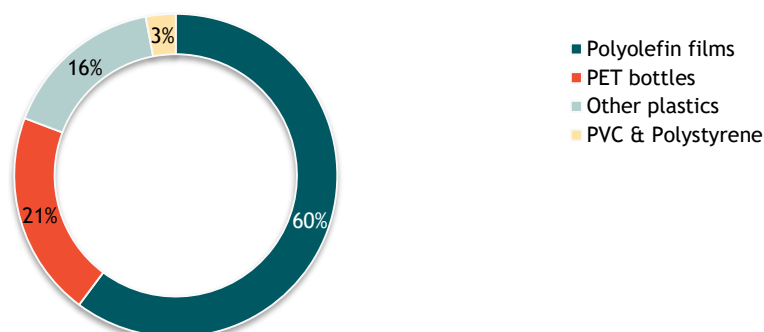
⁵⁵ Ministre de la Gouvernance locale, du Développement et de l'Amenagement du Terroir (2016). Report Of The National Campaign For The Characterization Of Household And Similar Wastes.

⁵⁶ Mafrwestafrica.net (2020). Gestion Des Déchets.

Figure 2-10 Average waste generation by category (%)⁵⁷

*Other = Fine elements (47%), Textiles and sanitary textiles (6%), Complex (6%), Combustible (2%), Non-combustible (4%), DMS (1%)

Figure 2-11 provides a detailed analysis of the plastic waste produced. Four sub-categories have been defined. These are polyolefin films, PET bottles and flasks, PVC and polystyrenes and other plastics.

Figure 2-11 Plastic waste generated in Senegal by type (%/day)⁵⁸

Senegal generates 345,814 tons of polyolefin film waste per day, 94 tons/day of PET bottles and flasks, 79 tons/day of other plastics and PVC and polystyrenes account for 18 tons/day.

Table 2-3 SénéSurf - Restaurant Cococabana, Dakar: Zero Waste Restaurant | Zero Waste Restaurant

SénéSurf - Restaurant Cococabana, Dakar: Zero Waste Restaurant

An encouraging example of waste minimisation is the multi-stakeholder supported zero waste restaurant 'Copacabana' in Dakar. Marine plastic pollution and the growing impact of waste on the coast spurred the owner to action. Owner, Babacar Thiaw, worked with Association Zero Déchet Sénégal to transition his restaurant to zero waste. "The biggest challenge was finding out where to start, the transition is often daunting and support and knowledge-sharing plays a key role in ensuring concepts reach fruition."

Challenges identified by Thiaw include: Sourcing local alternatives to single-use plastic products and engaging the team with the zero-waste vision. An intermediate step for sourcing alternatives is the need to localise imports. In Copacabana's case, reusable cups are imported from Europe and locally branded with information about why the cups are reusable. A deposit is added to the cost of the beverage to ensure return of the cups. The restaurant doubled its turnover in the period Sept-Dec 2019. This has put them in the position to make renovations and prepare the restaurant for reopening in June 2020 (post-Covid 19). Renovations will allow for social distancing and additional hygiene measures, increasing the restaurant's chance of surviving the knock-on impacts from the Covid-19 crisis. This example highlights the opportunity but also shows gaps for local players to adopt circular economy principles. It emphasises the role localisation needs to play to speed up adoption.

⁵⁷ Ministre de la Gouvernance locale, du Développement et de l'Amenagement du Terroir (2016). Report Of The National Campaign For The Characterization Of Household And Similar Wastes.

⁵⁸ *ibid.*

Waste disposal

Landfill remains the main means of disposal of collected waste. Incineration, composting and other biological treatments are the exception. Landfills are also used for biomedical and industrial waste, even though these are considered hazardous. The landfills are unenclosed and have no adequate system for treating liquids resulting from the decomposition of waste (leachates) and landfill gases.⁵⁹

Waste management in Senegal is extremely complex and is decentralised with many stakeholders involved. The informal sector also plays a large role in waste management activities, particularly on the Mbeubeuss landfill site in Dakar. Waste disposal in Senegal involves two main local realities: in Dakar, collection companies dump waste in Mbeubeuss, while in the rest of the country and in households without collection services, uncontrolled dumping and incineration are the norm. Although no area is theoretically excluded from official waste collection and disposal, some neighbourhoods have long had more access to services than others.

The Government of Senegal, with the support of the World Bank, is implementing the Project for the Promotion of Integrated Management and Economics of Solid Waste (PROMOGED), part of phase 2 of the National Waste Management Programme (PNGD). This project aims to improve operation of the solid waste management system in local authorities through the installation of pre-collection and collection equipment, the construction of solid waste treatment infrastructure in the targeted localities and strengthening of the capacities of the actors for a sustainable management of the selected management system. The project will be funded by the French Development Agency (AFD), the Spanish Agency for Cooperation and Development (AECID), the European Investment Bank and the World Bank IDA. The project will be implemented by the Unite de Coordination et de Gestion (UCG) at the Ministry of Urbanism, Housing and Living Environment.⁶⁰ UCG, a public waste collection operator, is a Specialist in Environmental and Social Safeguards (SSES) of PROMOGED.

The PROMOGED project plans to establish three technical landfill sites at Touba, Tivaouane and Kaolack, three sorting and transfer centres in the same localities, and also 90 standardised grouping points.⁶¹ The Mbeubeuss site will be refurbished to ensure compliance with international standards and requirements. Rehabilitation of the Mbeubeuss dumpsite⁶² is a way of reducing the current impacts noted within and around the dumpsite. The installation of a transfer and sorting station (CTT) and a composting platform is part of the planned rehabilitation of the dumpsite, which aims to stop the process of environmental degradation and the reintegration of the dumpsite in the natural environment.

Of special note is the presence and involvement of informal waste pickers and the ecosystem developed around the Mbeubeuss site. Potential negative impacts may be related to economic losses of waste pickers and other current workers in the landfill, as well as the owners of vegetable gardens and concessions that will be affected by the project.⁶³

Collection and recycling

The Recycling Sector In Senegal For The Metal And Plastic Sectors report⁶⁴ identifies aluminium, copper, brass and bronze as the most valuable metals for collection. Aluminium is highly sought-after, with 93%

⁵⁹ UNEP (2018). Green Economy Assessment Study.

⁶⁰ Ministre de l'Environnement et du Développement Durable (2020). PROJECT FOR THE PROMOTION OF INTEGRATED MANAGEMENT AND ECONOMICS OF SOLID WASTE IN SENEGAL (PROMOGED).

⁶¹ DAKARACTU.COM (2020). Gestion Durable Des Déchets Solides Urbains (PGDSU): Une Nouvelle Generation D'Infrastructures Pour Impulser La Valorisation Des Déchets.

⁶² World Bank (2020). Municipal Solid Waste Management Project.

⁶³ World Bank (n.d.). SENEGAL MUNICIPAL SOLID WASTE MANAGEMENT PROJECT (P161477) EXECUTIVE SUMMARY OF THE ENVIRONMENTAL AND SOCIAL ASSESSMENT (ESIA) FOR THE REHABILITATION OF THE MBEUBEUSS DUMPSITE.

⁶⁴ PS-EAU (2002). The Recycling Sector In Senegal For The Metal And Plastic Sectors.

of collectors gathering it for resale to craftsmen and industries. Light aluminium consists mainly of packaging and is recovered from homes, metal workshops and joineries, and hotels and restaurants, while heavy aluminium is recovered from garages and industries. An estimated 120 tons/year aluminium waste (0.6% of the metal waste deposit) is produced in Dakar, of which at least 50% is exported to Europe. Transfer of technologies and expertise in metals recycling and the artisanal smelting sector, can increase production capacity and improve the quality of products.

Circular economy initiatives are already taking place at the private sector level in West Africa. They may not be labelled as circular economy, but they are addressing the pressing problems that circular economy aims to solve.⁶⁵ This is especially evident in the recycling sector. Examples of initiatives are listed in Table 2-3. The role and importance of the informal sector cannot be over-emphasised.

WEEE recycling

At the international level, Senegal has ratified and adopted the decisions of the various environmental conferences, particularly those of Rio and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Environmentally Sound Disposal. Locally the Environmental Code (Law N°2001-01 of 15 January 2001, Decree N°2001-282 of 12 April 2001) is the main legal instrument for waste management. However, locally, there are no specific regulations for the management of waste electric and electronic equipment (WEEE) / e-waste currently in effect. A decree for the management of WEEE has been written with the input from stakeholders which include the Ministry of the Environment, and facilitated by the Global Green Growth Initiative (GGGI).

Responsibility for WEEE has been allocated by the decree: The Ministry in charge of the Environment manages WEEE in collaboration with the Ministries in charge of Finance, Trade, Industry, Transport, Health, Local Authorities as well as the Ministry in charge of the Digital Economy and of Telecommunications, technical supervision of the State IT Agency (ADIE) in accordance with the laws and regulations in force.⁶⁶ The decree is currently with the Department of Environmental Affairs and Sustainable Development, pending acceptance. The decree is part of a broad e-waste intervention strategy which includes a value chain mapping of WEEE, across both the formal and informal sectors⁶⁷.

The GGGI has mapped the WEEE actors in Senegal⁶⁸, see figure 2-12 below. Currently the formal sector is limited to Agence de l'Informatique de l'Etat (ADIE), e-waste department with a pilot project to collect and treat all WEEE from the administration in Senegal. They also accept some e-waste from private actors, but not much. However, a large collection activity followed by recovery and recycling is identified. Recovery generally concerns electronic circuits (diodes, transistors etc.) and other parts. Recycling remains at the artisanal stage and the sector is mainly under the control of traditional foundries where production is still low and is intended for the needs of blacksmiths (aluminium) and fishermen (lead).

⁶⁵ 2019. RAPPORT DE LA CONFÉRENCE REGIONALE DE HAUT NIVEAU Economie circulaire, industries vertes et emplois en Afrique de l'Ouest.

⁶⁶ DRAFT: Projet de décret n°. Relatif à la gestion des déchets d'équipements électriques et électroniques (DEEE).

⁶⁷ Interview: Modou Fall GGGI Senegal: Project Manager E-waste Programme. 27 August 2020.

⁶⁸ 2020. Assistance Technique Pour La Gestion Durable Des Déchets D'Équipements Électriques Et Électroniques (D3E) Au Sénégal. Global Green Growth Institute.

Table 2-4 Projects and initiatives: Waste Management

Topic	Project	Detail	Impact
Organic waste Female empowerment	Reuse waste charcoal as biochar. ⁶⁹ Provide households with biochar made from clay and charcoal waste.	<ul style="list-style-type: none"> High-quality biochar using an innovative rotor press. Biochar reduces negative health and environmental impact. Distributed via sales network mainly managed by women. 	<ul style="list-style-type: none"> Protect women's health. Biochar smokeless, odourless. Cost-saving. Reduce deforestation. Reinvest into reforestation.
Waste minimisation	Zero Waste Restaurant: The Copacabana Surf Village in Dakar ^{70,71}	A seaside restaurant focusing on waste minimisation. Implemented alternatives to reduce waste. Waste management and sorting in partnership with local company.	<ul style="list-style-type: none"> Reusable straws, cloth towels. Returnable, reusable cups. Packaging free shopping. Maintenance and hygiene with natural products. Fresh fruit for natural juices.
E-waste	ProPlast and SonaTel ⁷²	<ul style="list-style-type: none"> Sonatel: limit waste and promote recovery, recycling throughout supply chain. Waste treatment by sorting at source for recycling and recovery. 	Recover 2G terminals from customers by subsidising 3G smartphones. Recovered devices recycled with partners.
	SetTIC: ⁷³ eco-society operating in recycling and beneficiation of WEEE in Senegal.	<ul style="list-style-type: none"> Collection of special waste e.g. batteries and print cartridges. Environmentally friendly solution for managing end-of-life of electrical and electronic equipment. 	Transparency throughout recycling process with reporting and traceability of WEEE
	SENECLIC: ⁷⁴ initiative from UNESCO.	Multi-actor partnership for collection of new and second-hand IT equipment of quality.	<ul style="list-style-type: none"> Digital Education in elementary schools: multimedia rooms; train teachers to teach students using digital tools Reinforce reconditioning of IT equipment and e-waste management.
ICT enabled waste management	Senrecycle SARL: SENRECYCLE ⁷⁵	Senegalese 2.0 start-up: collection and recovery of plastic waste. Communication system (mobile platform, web, SMS and QR) with geolocation.	<ul style="list-style-type: none"> Targeted waste collection schedule for plastic waste. The company is not yet fully operational.
Local processing	Ciprovis ⁷⁶ : waste recycling start-up from Dakar	<ul style="list-style-type: none"> Waste collection solution using tricycles (motorcycles pulling garbage bins). Environmental education and awareness raising at schools via "green classes". 	<ul style="list-style-type: none"> 1000 households, to which must be added businesses, restaurants, hotels Waste recycled at Bambilor recycling centre. Composting centre for organic waste; Shredder for solid plastic materials.
	Coca-Cola Senegal ⁷⁷	Container recycling project since 2018. Bottle-to-bottle system	Aiming to recycle all containers by 2030.

⁶⁹ SEED (2020). Reusing Waste Charcoal As Biochar.⁷⁰ Reuters.com (2020). Senegal To Crack Down On Huge Plastic Waste By Enforcing Law.⁷¹ Voice of America (2020). Surfer Launches Dakar's First Zero-Waste Restaurant.⁷² Site Institutionnel du Groupe Sonatel. 2020. Environment: Sonatel And Proplast Industrie Sign A Partnership To Set Up Kiosks For The Recovery Of Plastic Waste.⁷³ Settic.sn. 2020. Settic Accueil.⁷⁴ DIGITAL SOLIDARITY PROGRAM 2011-2015.⁷⁵ Senrecycle.business.site (2020). Senrecycle.⁷⁶ Lepetitjournal.com. 2020. Ciprovis: La Start-Up Dakaroise Qui Recycle Les Déchets.⁷⁷ Marques (2020). Sénégal. [online] Coca-colaafrique.com.

Existing extended producer responsibility (EPR) and deposit return schemes (DRS)

Currently there are no implemented EPR schemes in Senegal. The uptake of the principle has been recommended and discussed in various studies, recommendations and reports. The “Plastic Law” enacted in January 2020 is expected to revolutionise the way waste is handled in Senegal. The law clearly mentions EPR for plastic, however, it is unclear whether producers will be monitored by an industry body or whether compliance will be imposed by the state or a state agency.

The most advanced discussions are in the plastics sector (as above, regarding the Plastics Law) and for WEEE, particularly for used car batteries. Development of legislation for WEEE EPR is ongoing, however no policy exists as of yet. The Global Green Growth Initiative (GGGI) supports e-waste management in Senegal, this may be the opportune time to push for implementation of an EPR scheme for Senegal.

2.3.4 Opportunities in other sectors: Transport and mobility

The transport sector, accounting for about 7% of the country's GDP, is dominated by the road sector with about 99% of domestic movements of people and more than 95% for goods.⁷⁸ Implementation of circular economy models in the transport sector is not yet happening, with the pressure to establish an accessible and working public transport network a key priority. A circular urban mobility system focuses on effectively accommodating the user's mobility needs by diversifying modes of transport. The circular models and opportunities that may be most accessible to Senegal's urban sprawls in future, include⁷⁹:

- Using big data solutions to optimise mobility systems;
- Designing vehicles for adaptable and shared use;
- Design for zero-emission transport vehicles and energy grids;
- Designing transport infrastructure for adaptable use;
- Designing regenerative and energy positive, mobility infrastructure;
- Refurbishing and repairing vehicles to extend material cycles.

Urban mobility in the greater Dakar area and in Senegal as a whole, remains a key challenge for national and local governments. Mobility is hampered by congestion, lack of infrastructure (roads, transboundary rail) and the extent of urban sprawl. The majority of Senegalese travel by foot or depend on public transport (Table 2-4). Urban mobility needs to be supported with pedestrianised spaces, as well as an integrated public transport system.

Table 2-5 Public transport in Dakar by user (%) (2000 vs 2015)

Travel mode	2000	2015
Did not travel at all	12,5	15,4
Travelled only on foot	49,2	39,1
User of public transport	30,8	37,9
User of a personal motorised mode	5,8	5,9
User of other modes (non-motorised and motorised)	0,6	1,2
Urban and inter-urban traveller	1,1	0,5

Source: Lourdes Diaz Olvera, Didier Plat, Pascal Pochet. *Changes in daily mobility patterns in Dakar (Senegal)*; 14th World Conference on Transport Research, WCTRS-Tongji University, Jul 2016, Shanghai, China

⁷⁸ IGLU (2020). *Le Systeme De Transport Urbain Dans La Region De Dakar - Senegal: Contraintes Et Perspectives* | IGLUS.

⁷⁹ Ellen MacArthur Foundation (2020).

As it can be seen in Table 2-4, in the period 2000-2015 there was an increase in the users of public transport in Dakar, pointing to the feasibility and need for a better integrated, multi-modal public transport system.

Transport needs within Dakar are greater than the supply.⁸⁰ Although informal transporters (in 2015 high-speed buses had only 20% market share of public transport) play a major role in addressing unmet demand, the quality of service is deteriorating. The government has decided to use World Bank funding to renew the high-capacity bus fleet operated by SOTRAC (on the verge of bankruptcy). The objective of the Urban Mobility Improvement Project (UMIP) was to improve the safety, efficiency, and quality of urban mobility in the metropolitan area of Dakar and road safety in Thiès and Kaolack. It included activities to rehabilitate and construct new roads, upgrade railways, replace minibuses through an innovative funding and leasing scheme, improve air quality, and strengthen institutions.⁸¹ Renewal of public transport has resulted in the scrapping of a number of vehicles previously employed in the sector. The waste associated with the scrapped vehicles needs to be addressed and incorporated into a cohesive plan for the management of scrap tyres and batteries.⁸²

2.4 Policy framework supporting circular economy activities

2.4.1 Overview of the policy framework in the context of circular economy

The Emerging Senegal Plan (PES) plays a major role in accelerating economic growth⁸³. Senegal further benefits from the political will to support green growth and opportunity, with commitment from President Macky Sall to establish Senegal as a trailblazer in environmental protection.⁸⁴ Senegal is a member of the Partnership for Action on Green Economy (PAGE), which has developed a model for supporting Member States in a just, fast and fair transition to an economy that is low-carbon, resource-efficient, and equitable – an inclusive green economy.⁸⁵

The PES 's strategic objectives are based on a value chain that expresses food security and sustainable development as strongly intertwined. Sustainable land management is analysed as a condition for achieving agro-sylvopastoral productivity for the upliftment of rural areas. Policy frameworks that support the strategic framework include the National Strategic Investment Framework for Sustainable Land Management (CNIS-GDT).

The government has established a strategic framework on the green economy and promotes green industrialisation and the development of green jobs and businesses. Although this framework does not directly refer to circular economy, policies and legislation falling outside of this scope have included the role of environmental and waste management legislature, sustainable land management policy (Annex C).

The Directorate of Green Financing and Partnerships (DFVP) of the Ministry of the Environment and Sustainable Development (MEDD) has carried out a study on the concept of the circular economy and its stakes for Senegal. This study has given rise to a roadmap of the circular economy in Senegal (FRECS)

⁸⁰ Faye, A. (2017). FIRST PROMOTION OF MASTER II "TRANSPORT AND SUSTAINABLE MOBILITY IN AFRICAN CITIES".

⁸¹ Worldbankgroup.org (2020). Improving Urban Transport: 5 Lessons From Senegal.

⁸² Aminata MBOW DIOKHANE (2020). Head of Center for Air Quality Management, INTERVIEW.

⁸³ Presidence.sn (2020). Emerging Senegal, Economic & Social Policy Of The Republic Of Senegal.

⁸⁴ Sustainability-times.com (2019). Senegal: Africa's New Waste Warrior?.

⁸⁵ PAGE 2030 Strategy and Development Plan 2021-2025.

proposing actions at various levels of intervention. It should be noted that this roadmap should be updated.⁸⁶

Most recently, Senegal adopted the **Anti-plastic Law No. 2020-04 of January 8, 2020**. The adoption of **Law No. 2020-04** addresses the prevention and reduction of environmental impact of plastic products, and repeals and replaces Law No. 2015-09 of May 4, 2015 on the prohibition of the production, import, possession, distribution, use of thin polyethylene plastic bags of and the rational management of plastic waste. The amendments to the law in 2020 include the following:

- Prohibition of certain single-use plastic products or disposable plastic products; non-essential plastic products for which there are sustainable alternative solutions;
- Total ban on plastic bags at retail checkout;
- Deposit on plastic bottles to improve collection and recycling;
- Producers obligation (extended responsibility), to ensure management of waste from the products in marketplace;
- Obligation to incorporate recycled plastic in the manufacture of new plastic products;
- Imposition of a tax on non-recyclable plastics to encourage use of recyclable plastics;
- Ban on importing plastic waste into Senegal.

The law's direct mention of mandatory Extended Producer Responsibility (EPR) is ambitious considering that there is no voluntary EPR being implemented in Senegal at the time of preparing this report. The law⁸⁷ does not pertinently mention a category definition, which means that all products that include plastics will be impacted by the proposed (very broad) EPR. The prohibition of certain single-use products and the mandatory inclusion of recycled content can drive circular economy approaches across the value chain, when implemented.

The existence of strategic and legal frameworks, and related projects/programmes shows that there is an increasing national awareness that supports the greening of the Senegalese economy.⁸⁸ This is a useful springboard for a circular economy transition.

2.4.2 Nationally-driven financial programmes and initiatives supporting circular economy-related sectors

Project for the Promotion of integrated Management and Economics of Solid Waste in Senegal (PROMOGED): Senegal municipal Solid Waste Management Project⁸⁹

PROMOGED aims to improve the functioning of the solid waste management system in the local communities by setting up equipment for pre-collection, collection, construction of solid waste treatment infrastructures in the targeted localities and capacity building of actors for sustainable management of the chosen management system.⁹⁰ It supports the global initiative to tackle marine litter and will improve

⁸⁶ Directorate of Environment And Classified Establishments (DEEC), Financing and Partnerships Division (DFVP), e-mail communication and submitted answers. 8 June 2020 Mr. Al Hassane DIOP, Director of Green Financing and Partnerships (DFVP) of the Ministry of the Environment and Sustainable Development (MEDD), Mr Cheikh FOFANA, Deputy Director of Environment and Classified Establishments (DEEC) of the Ministry of Environment and Sustainable Development (MEDD).

⁸⁷ Côte, A. (2020). Loi N° 2020-04: Note De Positionnement De L'Association Zéro Déchet Sénégal - Zerowastesenegal.Org. [online] Zerowastesenegal.org

⁸⁸ Green Economy Coalition (2018). The Green Economy barometer.

⁸⁹ The Projet pour la Promotion de la Gestion Integree et de l'Economie des Déchets Solides au Sénégal (PROMOGED).

⁹⁰ World Bank (2020). Senegal: Ameiorer La Gouvernance Et La Gestion Des Dechets.

collection, transport, recycling, and disposal of waste in coastal cities such as Dakar, Saint Louis, and Mbour, as well as cities along major rivers discharging into the ocean including Ziguinchor.⁹¹

The project further aims to strengthen institutional robustness, citizen engagement and capacity building⁹². The aim is to strengthen local governance by providing training in local municipalities for stricter regulation, and more efficient procedures for mobilising resources and forging partnerships. For a transition to a circular economy in a developing economy, especially in the case of waste management in Senegal, the entire value chain needs to be built, which requires inclusion of all stakeholders: public, private, NGOs and the informal sector.⁹³

PROMOGED is structured around three components:⁹⁴

1. Strengthening Sector Governance and Institutional Capacity;
2. Improving Solid Waste Infrastructure and Services in Selected Agglomerations. Realistic approach for improving the condition of the Mbeubeuss dumpsite in the short, medium and long-term, with the perspective of a long-term waste treatment and disposal system.
 - 2.1. Phase 1 (Year 1-2): implement emergency measures to improve site and working conditions of waste pickers;
 - 2.2. Phase 2 (Year 2-4): reshape landfill to reclaim part of the land. Reclaimed land will be used for construction of sorting and composting facility. Waste remodelling to optimise dumpsite footprint and control and manage leachate runoff and infiltration;
 - 2.3. Phase 3 (Year 5-6): permanently capping waste at Mbeubeuss and distinguish between pre-sorted and residual waste. Only pre-sorted waste will be allowed at transfer and composting facilities managed by former waste pickers. Residual waste will be managed in the new long-term waste treatment and disposal system;
3. Project Implementation Support: project management, coordination, communication, monitoring and evaluation.

In addition, the **City Resilience Program (CRP)** has been working to plug into the PROMOGED project as an anchor loan to identify an opportunity for structuring a PPP to build and operate a new network of waste sorting and processing facilities, and to formalise and improve the existing municipal system of waste processing. CRP is a partnership between the World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR) – a multi-donor initiative aimed at increasing financing for urban resilience.⁹⁵

Table 2-6 Other nationally driven financial programmes

Programme	Goals and priority areas
Programme National de Gestion des déchets (PNGD) [National Waste Management Programme] 2015/2020	<ul style="list-style-type: none"> • "Towards "zero waste" territories, a lever for an emerging Senegal" • Deals with excessive amount waste generated by increasingly urbanised population. Approach considers sanitation, respect for environment and circular, social and solidarity economy

⁹¹ *ibid.*

⁹² GFDRR.org (n.d.). Dakar: Minimizing Waste Challenges, Maximizing Urban Resilience.

⁹³ Mélanie Grignon: Agence Française Développement PROMOGED project. E-mail communication 15 June 2020

⁹⁴ World Bank (2020). Senegal Municipal Solid Waste Management Project Environmental and Social Impact Assessments For Mbeubeuss And Mbaoexecutive.

⁹⁵ Gfdr.org. 2020. City Resilience Program | GFDRR.

Programme	Goals and priority areas
Projet de gestion durable des déchets solides urbains (PGDSU) [Sustainable Urban Solid Waste Management Project]	<ul style="list-style-type: none"> Phase 1 of National Waste Management Programme (PNGD) covers entire national territory. Construction of solid waste treatment infrastructure and equips local authorities with waste collection equipment. Construction of three Integrated Waste Recycling Centres and 32 standardised collection points in Dakar, Kaolack, Tivaouane and Touba. Contribute to raising household collection rate to more than 95% in the targeted communes. Financed up to CFAF 17.5 Billion by Islamic Development Bank for benefit of local authorities in the Dakar region and communes of Tivaouane, Touba and Kaolack.
Support Programme for the Creation of Green Jobs Opportunities (PACEV)	<ul style="list-style-type: none"> Government launched joint USD 5 Million programme with UNDP in 2016, to create green employment opportunities in agriculture, industry and service sectors. Create 10,000 jobs in green economy. Reduce unemployment among youth and women, creating wealth and protecting environment.

2.5 Enabling environment on trade and investment in Senegal

This section is a snapshot of the trade and investment situation in Senegal. A more detailed analysis can be found in Annex C.

There is substantial trade between Senegal and its international trading partners, with a share of trade in the total economic output similar to the world average. Its trade balance shows a stronger import activity, especially with the EU. In 2018, around 15% of Senegal's exports were destined for the EU while 38% of Senegal's imports originated from the EU, it has been slowly decreasing since 2010. Similar trend can be observed in the sector of environmental goods and services which are mainly imported (this is further discussed in Chapter 4.4).

In terms of foreign investments, Senegal is doing relatively well, with investments steadily growing the last few years, and currently, with 3% FDI at levels above the world average and other relevant regions' average.⁹⁶ Senegal's GDP development is on an upward trend together with a slowly increasing inflation rate.

Opportunities and barriers for trade

The barriers mentioned in the following related to trade tariffs, costs and infrastructure are meant to be tackled within the Emerging Senegal Plan (ESP), in which the government seeks to deepen regional integration by further developing the infrastructure network, eliminating barriers to the free movement of persons, goods, and services, and developing intra-community trade.⁹⁷

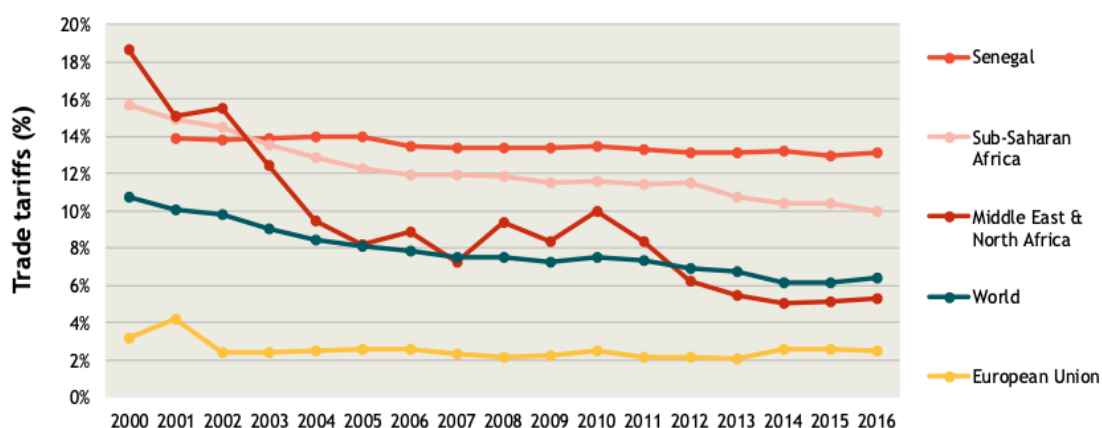
⁹⁶ World Bank(2019). World Bank - World Development Indicators - FDI inflows as share of GDP (%).

⁹⁷ Societe Generale (2020). Country risk of Senegal: International Trade.

Trade tariffs

Trade tariffs in Senegal are very high and stable in the period 2001-2016, at an average of 13%⁹⁸, way above world average levels. In 2016, trade tariffs are twice as the world average tariffs (6%) and around six times higher than the EU tariff trades (2%). Senegal furthermore applies the common external tariff of ECOWAS with five tariff rates: 0% for basic consumer goods, 5% for raw materials and capital goods, 10% for intermediate products, 20% for finished goods and 35% for sensitive goods. Temporary special taxes are levied on certain agricultural products. Certain foods, beverages, tobacco products, cosmetic products as well as fuels and motor vehicles are subject to excise duty. Additional taxes are levied on alcoholic beverages, mining and quarry products, and cement.⁹⁹ The relatively very high trade tariffs in Senegal can be considered a barrier for growth in international trade. When asked in 2014 for the biggest obstacle in doing business in Senegal, customs and trade regulations were considered the 4th biggest obstacle to doing business.¹⁰⁰ Despite advanced regional integration processes, barriers to intra-regional trade remain a challenge for the economies in West Africa such as the trade-weighted average tariff rate remaining relatively high and some of the non-tariff barriers increasing the cost of trade.¹⁰¹

Figure 2-12 Mean of the tariff rates applied to all products in Senegal (%)



Source: World Bank - World Development Indicators - Tariff rate, applied, simple mean, all products (%)

Senegal's trade policy is aimed at building a competitive economy, through inclusive growth and job creation. Its policies are designed to help reduce the trade deficit, ensure regular supplies to the domestic market, promote local value chains, strengthen the regional integration process and access to international markets, and promote competition. Under the ESP, the government seeks to deepen regional integration by further developing the infrastructure network; eliminating barriers to the free movement of persons, goods, and services; and developing intra-community trade.¹⁰²

Trade costs

Apart from trade tariffs, there is a wide variety of costs associated with trade of products and services, including cost related to border compliance and documentary compliance. The 'ease of doing business index' of the World Bank scores the position of a country based on empirical research on the trade costs of countries (the higher the score, the easier doing business is for the country). Based on the index results (Figure 2-12), Senegal's score has improved over time both for exports as well as for imports and sits

⁹⁸ World Bank (2018) World Bank - World Development Indicators - Tariff rate, applied, simple mean, all products (%).

⁹⁹ GTAI Germany Trade & Investment (2020). Basiswissen Einfuhr in Senegal.

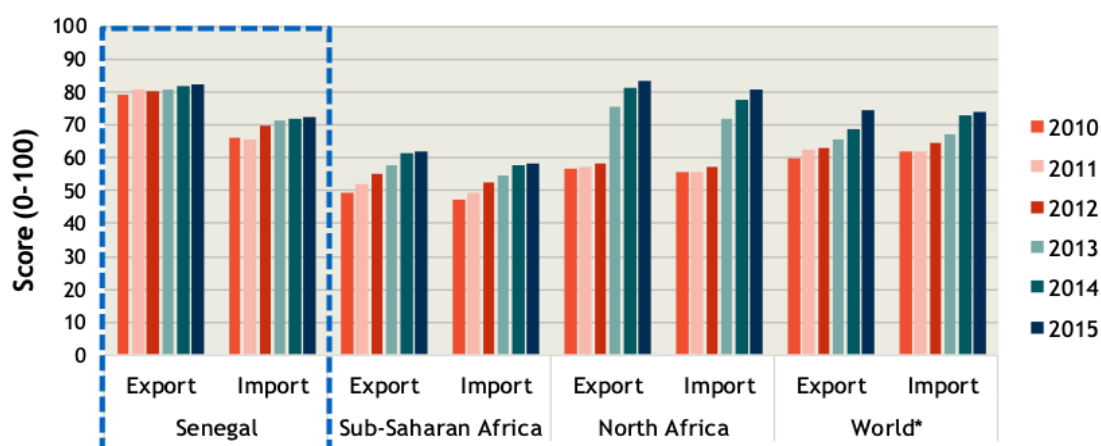
¹⁰⁰ World Bank (2016). Enterprise Survey 2016.

¹⁰¹ International Trade Centre (2014). ITC by Country Report Senegal.

¹⁰² Societe Generale (2020). Country risk of Senegal: International Trade.

(2015) at 82 (out of 100) for exports and at 72 (out of 100) for imports. In the period 2010-2015 Senegal has outperformed the average of Sub-Saharan Africa, both for imports and exports, and the world average, for exports. It has also scored better than North Africa and the world average until the years 2012 and 2013 respectively, when the scores of these started to improve faster than that of Senegal. South Africa's score trend has also been way better than that of Kenya and Rwanda, almost as good as that of Nigeria, and considerably lower than the score of Morocco.¹⁰³ Senegal is ranked 123 among 190 economies in the ease of doing business, according to the latest World Bank annual ratings (2019).¹⁰⁴ This implies customs and administration related costs have been overall relatively low, thus driving trade in the country.

Figure 2-13 Score on cross-border trade costs for exports and imports in Senegal in comparison to global and regional averages



Source: World Bank - Ease of doing business - Trading across borders: Cost to export/import (US\$ per container) (DB06-15 methodology) - Score

Suitability of infrastructure for trade

In order to facilitate trade, and reduce transport time and costs, the presence of good transport infrastructure is essential. The World Bank monitors the quality transport infrastructure as part of the logistics performance index. The results of this index for Senegal (Figure 2-13) show that the quality of trade and transport-related infrastructure in Senegal has worsened in time, from a score of 2.6 (out of 5) in 2010 to a score of 2.2 (out of 5) in 2016. In 2010, this logistics index in Senegal was comparable to the world average (2.6%), just below the score of the MENA region (2.8%) and scoring better than the Sub-Saharan Africa average (2%). In 2016, Senegal scored worse than those. Based on this, current quality of trade and transport-related infrastructure cannot be considered a driver for trade. However, since the implementation of the PES there has been support for a number of infrastructure projects aimed at fuelling growth. More than 221 kilometres of multi-lane motorways were constructed to boost connectivity within the country, and in January 2019 the 1.9 km-long Senegambia bridge to Gambia – one of the longest bridges in Africa – was opened to increase trade and commerce between the neighbours.¹⁰⁵

¹⁰³ See information in the individual other country reports for these countries.

¹⁰⁴ Trading Economics (2019). Ease of doing Business in Senegal.

¹⁰⁵ DHL (2019). A vote of confidence: Senegal on track for economic success.

2.6 Existing awareness and capacities on CE in Senegal

2.6.1 National awareness on circular economy

The existence of strategic and legal frameworks, and related projects/programmes shows that there is increasing national awareness that supports the greening of the Senegalese economy, and facilitates the country's commitment to sustainable development.¹⁰⁶ In addition to those mentioned (section 2.3, Annex C), there are currently various other initiatives that support efforts to achieve sustainable development in Senegal. As demonstrated by the international High-Level Regional Conference on 'Circular Economy, Green Industries and Jobs in West Africa', which was hosted in Dakar on the 22nd and 23rd of July 2019, the concept of circular economy is starting to get attention in this respect too.¹⁰⁷

Business and industry awareness

In line with the low national awareness levels beyond policy, the majority of Senegalese businesses and industries are not yet actively involved in green, sustainable or circular production activities. As a result, industrial activities in Senegal are characterised by an intensive use of natural capital and the use of carbon-intensive technologies, generating significant amounts of waste.¹⁰⁸ Senegal is, however, experiencing the first industrial initiatives recognising the advantages of a circular economy. These initiatives are mostly active in the field of waste management or recycling. Examples include the integrated waste-management company *Proplast* that specialises in the collection and recycling of plastic waste. Proplast recycles waste-plastic into pellets, which can later be reused as a secondary-material for the local plastic industry.¹⁰⁹ A similar approach is followed by Koa-Plast, a social business focused on waste management, specifically plastic recycling (PET, PEHD, PEBD). The enterprise is located in Kaolack, which is one of the most polluted cities on the African continent.¹¹⁰

To facilitate green entrepreneurship and raise industry awareness on sustainable and circular economy-related issues, a green entrepreneurship training was organised in December 2018 by PAGE. The event brought together 37 entrepreneurs.¹¹¹ The workshop promoted integration of environmental concern in the supply, production and marketing functions of existing companies' goods and services; orientation towards green business ideas and, where possible, the creation of green businesses. Sections of the workshop were hosted by trainers that were trained under the International Labour Organization (ILO) 'Start and Improve your Business Programme' (GERME), which is aimed at supporting small businesses in creating more sustainable jobs (also see 2.5.2.2).^{112,113}

Consumer awareness

The majority of Senegalese consumers are still mostly unaware of circular and green economy related approaches. This is particularly demonstrated by widespread poor consumer waste management patterns. Although most people are aware of the health impacts of insufficient waste management, dumpsites are often still a source of income-generating activities, especially for the poor. Efforts to improve solid waste management are therefore not always favoured by informal actors operating on dumpsites.¹¹⁴ As for the

¹⁰⁶ Green Economy Coalition (2018). The Green Economybarometer.

¹⁰⁷ European Commission (2020). Dakar Pathways To Advance Circular Economy, Green Industries And Jobs In West Africa.

¹⁰⁸ Green Economy Coalition (2018). The Green Economybarometer.

¹⁰⁹ Atkisson.com (2020). Sustainability Accelerator Network Proplast Brings Plastic Recycling And Livelihood To Communities In Senegal.

¹¹⁰ Ulule (2020). Kao-Plast, Social Business In Plastic Recycling.

¹¹¹ Un-page.org (2020). Start And Improve Your Business - Green Entrepreneurship Training In Senegal | PAGE.

¹¹² Ilo.org (2020). Start And Improve Your Business Programme (ENTERPRISES).

¹¹³ Un-page.org (2020). Start And Improve Your Business - Green Entrepreneurship Training In Senegal | PAGE.

¹¹⁴ African Population and Health Research Center (2020). Solid Waste Management And Risks To Health In Urban Africa.

broader community, either they do benefit from waste treatment and therefore actively take part in the process but try to safeguard their activity and revenue by fighting for being “formalised”, or they don’t work in the sector and are at worst passive but not restraining the process.

Community awareness in Senegal is often driven by local actors that engage on the ground. Copacabana Zero Waste Restaurant, for instance, leverages international platform **Surfrider**, a network of volunteers supported at national level by legal, policy and science experts.¹¹⁵ The network establishes affiliated chapters across the globe, such as in Dakar, to protect the oceans of the world. The restaurant currently hosts awareness raising campaigns such as beach clean-ups, and youth-focused dialogues with schools.¹¹⁶ Furthermore, public awareness is also spread via progressive artists using various media to engage the wider population. In Dakar, the use of street art is widespread, and an accepted format of engaging public dialogue on improvements to city life and civic responsibility.¹¹⁷

According to a survey by Association Zéro Déchet Sénégal¹¹⁸, current levels of consumer awareness in Senegal are mostly directed at the impacts of littering and do not yet extend to the benefits that a transition to a circular economy that eschews linear, single use models, can have.¹¹⁹ Additional awareness raising efforts and the promotion of new and sustainable production and consumption patterns through education at every level are therefore crucial.

Overview of awareness creation initiatives

Over the recent years, a number of awareness creation initiatives for circular economy-related measures have been launched in Senegal. In addition to state-organised donor- and state-funded initiatives, social entrepreneurs in Senegal are increasingly involved in awareness-raising efforts for circular economy. Some of the most relevant awareness initiatives are listed in Table 2-7.

Table 2-7 Awareness initiatives in Senegal

Institute/Association	Example projects	Priority areas
Association Zéro Déchet Sénégal	Supports communities, entrepreneurs, businesses and citizens to reduce waste and wastage. Supported establishment of a zero-waste restaurant (see below) that drives community awareness of benefits of sustainable choices.	Environmental protection initiative, campaigns for reduction and sustainable management of waste. Awareness on proper waste management during events, festivals and markets as well as in schools.
Copacabana Restaurant ¹²⁰	<ul style="list-style-type: none"> Restaurant impact on encouraging zero-waste movements to emerge across country (anecdotal). Environmental impact very visible on beach. Strong customer engagement in restaurant’s journey. 	<ul style="list-style-type: none"> Marine plastic waste. Localise supply chains. Community clean up initiatives Focus on getting people to act. In future, brands can leverage “green” but not yet, Senegal is still emergent.
UN Partnership for Action on Green Economy	PAGE co-organised Green Entrepreneurship Workshop. Training promotes environmental integration in supply, production and	<ul style="list-style-type: none"> Focus on operationalisation of PES five-year Priority Action Plan (PAP 2014-2018).

¹¹⁵ Surfrider Foundation (2020). Home.

¹¹⁶ Babacar Thiaw, Copacabana Restaurant, Telephone interview 18 May 2020.

¹¹⁷ Diversity of Cultural Expressions (2020). Dakar, Senegal.

¹¹⁸ Association Zero Dechet Senegal (2020). “Plastic Law” Perceptions And Expectations In Dakar.

¹¹⁹ *ibid.*

¹²⁰ Zerowastesenegal.org (2020). Qui Sommes Nous.

Institute/Association	Example projects	Priority areas
	marketing for existing companies; orientated towards green business ideas and, where appropriate, the creation of green businesses in Senegal.	<ul style="list-style-type: none"> Supports two pillars of PES green economy transition: “Structural Transformation of Economy and Growth” and “Human Capital, Social Protection and Sustainable Development”. Contribute to SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production) and SDG 17 (Partnership for the Goals).
CREATE!	Local-based NGO, CREATE!, engages rural communities in holistic circular economy interventions that take into account the target beneficiaries' priorities, including technology transfer adapted to the local environment.	<ul style="list-style-type: none"> Emphasis is on empowerment and inclusion - the community is actively engaged in the creation of solutions. CREATE! approaches development as a holistic system that needs to be created by and for the community.

Senegal's high mobile penetration rate would also allow for and increased online engagement on circular economy issues and opportunities. To this regard an awareness raising campaign that supports a transition for all would be beneficial, especially to the rural communities. However, as awareness alone is not sufficient, these efforts need to extend to engagement and implementation as well.

2.6.2 National capacities on circular economy

Education and skills gaps

The education and qualification level of the Senegalese population is still relatively low, and the areas covered by the curricula are limited. This leads to poor proficiency and low degree of application of science and technology as well as the common use of rudimentary production techniques and corresponding low productivity. Although access to education and technical training, and the pursuit of higher education has been improving steadily since 2000, the Gross Enrolment Ratio (GER) in higher education remains low (7% in 2017).¹²¹ Moreover, STEAM (science, technology, engineering, art and mathematics) education is underrepresented in Senegal's education system.¹²² This prevents Senegal from training sufficient professionals or senior technicians (“short degrees”) needed in the various sectors to increase productivity, attractiveness and innovation capacity, all of which is necessary for the transition towards a circular economy.¹²³

Vocational training capacities

In order to strengthen and advance its economic situation, Senegal urgently needs to create new jobs and new employment opportunities for its citizens. The state has therefore launched various initiatives to combat unemployment through vocational training.

Following a National Conference on Technical and Vocational Education and Training (TVET) held in March 2001, the State of Senegal adopted a new TVET strategy and provided additional institutional mechanisms. The reforms were introduced in the new Ten-Year Programme on Education and Training

¹²¹ Globalpartnership.org (2020). Senegal | Global Partnership For Education.

¹²² SEED (n.d.).

¹²³ Globalpartnership.org (2020). Senegal | Global Partnership For Education.

(Programme décennal de l'éducation et de la formation) which describes the following objectives for technical and vocational education and training:

- develop a qualified workforce in accordance with the needs of the labour market, developing workers, employees, technicians, supervisors and senior technical staff;
- promote the development of knowledge, employability, and creativity among youth and prepare them to become the important actors in the workforce;
- increase the number of people with professional and technical qualifications.¹²⁴

Besides the formal education activities, there is a range of non-formal TVET programmes available in Senegal. These include professional organisations in the private and public sector, Chambers of Commerce, handicraft organisations, non-governmental organisations and religious schools etc. Various ministries also provide apprenticeships and TVET programmes. For example, the former Ministry of Commerce, the Informal Sector, Consumption, and local products (Ministère du Commerce, du Secteur Informel, de la Consommation, de la Promotion des produits locaux) organised training programmes in Senegal and abroad.¹²⁵ The engagement platform *Make Sense*¹²⁶ has various programs on social entrepreneurship with a strong focus on green economy. So far, however, neither formal nor non-formal TVET have placed a particular emphasis on vocational training for green or circular jobs.¹²⁷

In order to remedy the resulting lack of green jobs and training capacities for a green economy, the Senegalese government, with the support of the Action Partnership for Green Economy (PAGE), drew up a national strategy to promote green jobs (SNEV strategy) in 2015. The SNEV strategy serves as a reference framework for green jobs in a resilient economy. Among other things, it focuses on creating green job opportunities while building up the necessary human capacities¹²⁸. Initiatives such as the Trainers Workshop to Support Green Enterprise Creation and Green Businesses conducted by PAGE in 2017 further complement these efforts. Through the training, PAGE supports Senegal in the framework of the project on the creation of green job opportunities (PACEV). During the course of the training 26 participants were trained to enable local entrepreneurs to identify environmental challenges and ways to overcome them, define the green enterprise and understand the benefits of green business¹²⁹.

The Senegalese government has further announced a USD 93.3 million project to promote entrepreneurship in rural communities, the Rural Youth Agripreneur Support Project. The initiative is backed by a USD 51,9 million loan from the International Fund for Rural Development (IFAD) and will provide training and financial support to young people in the agriculture, fisheries and pastoral sectors. Around 150,000 people, half of them women, are expected to benefit. By specifically targeting the rural community, the government is addressing an issue of pivotal importance across Africa: how to curb chronic levels of poverty and unemployment among the two-thirds of people who live outside the continent's big cities and dissuade young job-seekers from risking their lives by migrating both domestically and overseas in search of a better life.

¹²⁴ World TVET (2015). World TVET Database.

¹²⁵ *ibid.*

¹²⁶ Makesense Afrique (2020). Formations - Makesense Afrique.

¹²⁷ Clarisse Liautaud: Programme Officer - EU Emergency Trust Fund for Africa. Telephone interview: 2 June 2020.

¹²⁸ futurepolicy.org (2020). Senegal's National Strategy Promotion Of Green Jobs.

¹²⁹ Un-page.org (2020). Senegal And Burkina Faso Provide Training Of Trainers Workshop To Support Green Enterprise Creation And Green Business | PAGE.

3 Impacts and benefits of the CE in Senegal

3.1 Existing impacts and benefits

3.1.1 Economic impacts and benefits

The implementation of national policies and initiatives that are related to the circular economy have several positive impacts and benefits that include:

- Value creation through new business and employment opportunities, with employment impact that go beyond “creation” to include “substitution, elimination, transformation and redefinition” but with an overall increase of jobs created;
- increased exports of secondary materials, and local production;
- waste beneficiation projects.

3.1.2 Social impacts and benefits

The implementation of national policies and initiatives that are related to circular economy had several positive social impacts that include:

- creation of new job opportunities;
- capacity building, knowledge sharing and up-skilling;
- raising awareness among the public on better waste management practices;
- improved health conditions of the public as a result of safer waste management practices;
- improved health and safety conditions for workers in the e-waste sector.

3.1.3 Environmental impacts and benefits

The implementation of national policies and initiatives that are related to circular economy had several positive environmental impacts that include:

- reduced GHG emissions;
- improved air quality;
- water/resources/energy savings;
- recycling of wastes;
- diversion from landfill;
- raising awareness among the public on better waste management practices.

Due to the overlapping nature of these impact areas, the following table summarises some positive impacts resulting from the adoption/implementation of national policies and initiatives indicated in Section 2.2 and 2.4. Where relevant, economic, social and environmental impacts are highlighted for selected projects in Table 3-1.

Table 3-1 Economic, social and environmental impacts and benefits

Project	Economic impacts	Social impacts	Environmental Impacts
Agroecology Plus 6 Programme (Groundswell international) Assessing the spreading of agro-ecological practices across the Sahelian region		<ul style="list-style-type: none"> Over 94 women's savings and credit groups were established in 45 villages. 	<ul style="list-style-type: none"> Agroecological "foundational" innovations have been adopted by 2,308 farm families in six communes in three countries.
COMFISH		<ul style="list-style-type: none"> Organises workshops with women across Senegal to educate them on how to generate the highest profit with the fish they have available: the project organised 48 workshops and trained 2,078 individuals, achieving a completion rate of 99% of the annual target of 2,090. Apart from this, the project offered training courses on leadership to fifteen women leaders from 11 community-based organizations. These women leaders will in turn train their members during the chats they organize regularly in "mbars", or areas for breaks from work. In this way, they can reach out to a considerable number of women who work on the artisanal processing sites in Senegal. Some 41 grassroots organizations (CLPAs, CLPs, EIGs of women processors, MPA management committees) received support from the project. There were also 9,131 households that benefitted from the project's support through the local agreements it developed and established, and 5,449 households that benefitted from the climate change adaptation plans it prepared. 	<ul style="list-style-type: none"> 11 scientific studies were conducted on major topics to improve knowledge on fisheries resources, coastal community vulnerability and adaptation to climate change, and MPA governance. The studies made a substantial contribution to fisheries management. Local Agreements were established in Mbour, Joal and Sindia, allowing over 7,000 actors to apply new rules for management and improve the management of the 334,104 ha that make up the fishing areas of these CLPAs.
Bio Bissap	<ul style="list-style-type: none"> The groups sought net profits of at least 500,000 FCFA (USD 1,017). The bissap was profitable enough to allow THP-Senegal to scale up the project to its current size, which now includes 12 villages, with a total membership of 563 women. These women now plough and maintain a combined total of 21 hectares. 	<ul style="list-style-type: none"> Innovative production system. Offers resource-poor women land, inputs and professional training, and market access to become agricultural entrepreneurs. Approximately 120 women were initially involved, and each of the two groups subsequently cultivated one to two hectares of the hibiscus plant. 	
Reusing Waste Charcoal as Biochar		<ul style="list-style-type: none"> Providing urban and rural households with biochar made from clay and charcoal waste. Helping to protect women's health, as biochar is both smokeless and odourless. Saving money on fuel, allowing users to improve the living conditions of their families. 	<ul style="list-style-type: none"> Reducing deforestation by providing an alternative to collecting firewood. Reinvesting profit into reforestation, helping to reduce greenhouse gases.

3.2 Future impacts and benefits

As the Senegalese economy moves away from a traditional linear economy towards a more circular economy, this will be expected to have economic, social and environmental impacts. The following subsections present our modelling results, highlighting the direction and magnitude of potential impacts of the circular economy in Senegal.

3.2.1 Modelling approach and framework

The modelling of the macro-economic impacts of the circular economy transition in Senegal was carried out using Cambridge Econometrics' FRAMES model. This is an advanced input-output model, designed to enable the assessment of socioeconomic and environmental effects of energy, environment, and economy policies (for details see Annex D).

A conventional difference-to-baseline approach is followed. The circular economy (CE) scenario is compared against a baseline¹³⁰ in which no explicit assumptions are made about circular economy activity (a 'business-as-usual' scenario, in other words), in order to compare outcomes between the two.

We have adopted an 'activities' approach (rather than a 'policies' approach) to modelling the CE scenario. This choice means that the analysis does not assess potential impacts of specific policies but instead looks directly at the links between specific changes in an economy and the direct, indirect and induced effects, without making any explicit assumptions about whether these changes are driven by policies, behavioural change or new technology.

3.2.2 Modelling inputs for the CE scenario

Circular economy narrative

Based on our research on the trends in and opportunities for circular economy activities in the eight case study countries, five priority sectors have been chosen to be covered in the modelling exercise. Those are the waste sector, electronics manufacturing, the plastics sector, the agri-food sector and the construction sector. It should be noted that some specific circular activities that are currently commonly mentioned within the European policy and industry context were left out as we did not consider them realistic to be implemented within the coming decade, due to a lack of industrial development or circular economy awareness or the fact that the impacts will only materialise on a longer timescale (e.g. building design for de-construction or modular building design).

The sectors that we have focused on are the waste sector, the plastics (packaging) sector, electronics, agriculture and construction. The waste sector is an important enabler of a (more) circular economy and to be effective in this waste collection rates and recycling rates need to increase. Plastic (packaging) waste is a daunting problem in most African countries, a combination of more effective plastic waste collection and the recycling of plastic waste into new plastic packaging can make an important contribution to solving this urgent problem. E-waste is another challenge in several African countries, but with proper and safe treatment practices in place it also represents an opportunity for reusing and remanufacturing, resulting in an increased supply of affordable EEE products as well as an opportunity for recycling of valuable materials present in the E-waste, when high-value CE strategies are not feasible. Agriculture is still a critical part of the economy in many African countries. In this sector, substantial potential resides in the improvement of handling, storage and distribution of food products to prevent losses and to increase the use of organic fertilizers. Lastly, construction is a booming activity in Africa,

¹³⁰ The baseline is E3ME's standard projection to 2030 for the Senegalese economy, based on official published economic and energy forecasts. See Annex B for more details.

but up to now circular practices are virtually absent. Therefore, for the short term there seems to be potential for increasing the use of secondary materials in this sector, either directly or via construction products that incorporate by-products or waste materials.

Modelling assumptions

Where possible the aforementioned sectoral narratives have been translated into modelling assumptions. It should be noted that the aim of the exercise has not been to forecast the future in 2030, but to explore the impacts that more increased circularity could have by that year, were this to become a reality. To this end, we made evidence-based assumptions about the form and scale circular economy activities could take in Senegal by 2030 and used these as inputs into the model. These model inputs are summarised in Table 3-2.

Table 3-2 Circular economy activities and corresponding modelling inputs

Category	Circular economy activity	Modelling input
Waste management	Improved waste collection rate	Increase in waste sector output
Electronics, electric equipment & E-waste	Improved recycling of valuable materials in e-waste	Investment in recycling sector to improve health & safety standards (50% funded by industry, 50% funded through public/ODA financing)
		Exports of materials recovered from e-waste recycling
	Increased use of recycled materials in electronics production, replacing virgin metals and plastics	Shift in plastics' intermediate demand: reduced purchases from metals and plastics sectors, replaced by purchases from recycling sector
Agriculture	Prevention of food loss in agricultural supply chain through improved storage and logistics	Substitution of agricultural imports by domestic agricultural production
		Investment in storage and logistical capabilities (50% funded by industry, 50% funded through public/ODA financing)
	Increased use of organic fertilisers materials in agriculture, replacing use of mineral fertilisers	Shift in intermediate demand in agriculture: fewer purchases from chemicals, more purchases from agriculture
Plastics packaging	Increased use of recycled feedstock in plastics production, replacing virgin feedstock	Shift in plastics' intermediate demand: reduced purchases from chemicals sector, replaced by purchases from recycling sector
Construction	Increased use of recycled minerals in construction, replacing virgin minerals (glass, cement, sands, ceramics)	Shift in plastics' intermediate demand: reduced purchases from non-metallic minerals sector, replaced by purchases from recycling sector

Modelling limitations

As shown in the table, the circular economy activities and the related modelling assumptions focus on recycling and trade activities as well as on raw material inputs. There are two main reasons for this. First of all, due to the lack of well documented data, other activities ranking higher in the waste hierarchy, such as high-quality refurbishing (e.g. in the EEE sector), had to be neglected. Secondly, the technical construction and set up of the FRAMES model restricted the type of assumptions and inputs that could be used. For instance, in such a demand-driven framework, it is difficult to model an increase in recycling when this is not fully coupled with an increase in demand for recycled materials across sectors. As such, growing activity in the waste sector was limited to increasing waste collection rates. Furthermore, some

activities are hard to represent in the modelling as the sectoral aggregation is too coarse to allow for modelling for changes in production processes within sectors. These limitations are important to take into account, when interpreting the results presented in the following sections. The impacts that circular economy could potentially bring to the chosen sectors and countries are thus not fully covered in the modelling and could thus differ from the modelling outcomes in reality.

3.2.3 Modelling results

The modelling results presented in this section reflect differences between the CE scenario and the baseline by 2030, rather than the net effect of economic developments occurring between 2020 and 2030. For instance, if the price level in the CE scenario is reported as -1% by 2030, this does not imply that deflation occurred in the CE scenario, but that inflation was slightly lower in this scenario than in the baseline scenario.

Economic impacts and benefits

Our modelling suggests that circular economy activities in Senegal would have a positive impact on the Senegalese economy. By 2030, Senegal's GDP is projected to be around 1.9% higher in 2030 in the circular economy scenario compared to the baseline scenario. In other words, this suggests that the Senegalese economy would be slightly larger as a result of increased circular economy activity than it would be in a 'business-as-usual' situation. **Error! Not a valid bookmark self-reference.** 3-3 shows the CE scenario results for each of the components of GDP, as well as for the price levels. Results for the CE scenario are presented as differences from the baseline scenario by 2030, in absolute (monetary) and relative (percentage) terms.

Table 3-3 Macro-economic impacts of the CE scenario

Variable	Absolute difference from baseline scenario by 2030 (EUR 2019)	Relative difference from baseline scenario by 2030 (%)
GDP	+ EUR 311m	+ 0.6%
Consumer	+ EUR 56m	+ 0.2%
Investment	+ EUR 142m	+ 0.7%
Exports	+ EUR 13m	+ 0.1%
Imports	- EUR 100m	- 0.5%
Price level	-	- 0.2%

These results suggest that the positive economic impacts would be spread relatively evenly across the components of GDP: consumption, investment and the trade balance all see an improvement as a result of circular economy activity.

Some of these impacts can be attributed to the direct effect of the input assumptions in the circular economy scenario. The investment impact is partly driven by scenario assumptions of increased investment in the agricultural and recycling sectors, which account for around EUR 40m of the total EUR 142m investment impact. We have also assumed a fall in imports of agricultural products of EUR 131m (as a result of better prevention of food losses in the supply chain), which has directly affected the trade balance to a significant degree.

However, much of the impact would equally result from the downstream effects of these and other circular economy activities. The scenario assumptions of greater economic activity in the agricultural, waste management, recycling and electronics sectors would precipitate an increase in investment

spending by these sectors, leading to greater demand for construction and machinery: these impacts account for the remaining two thirds of the investment impact.

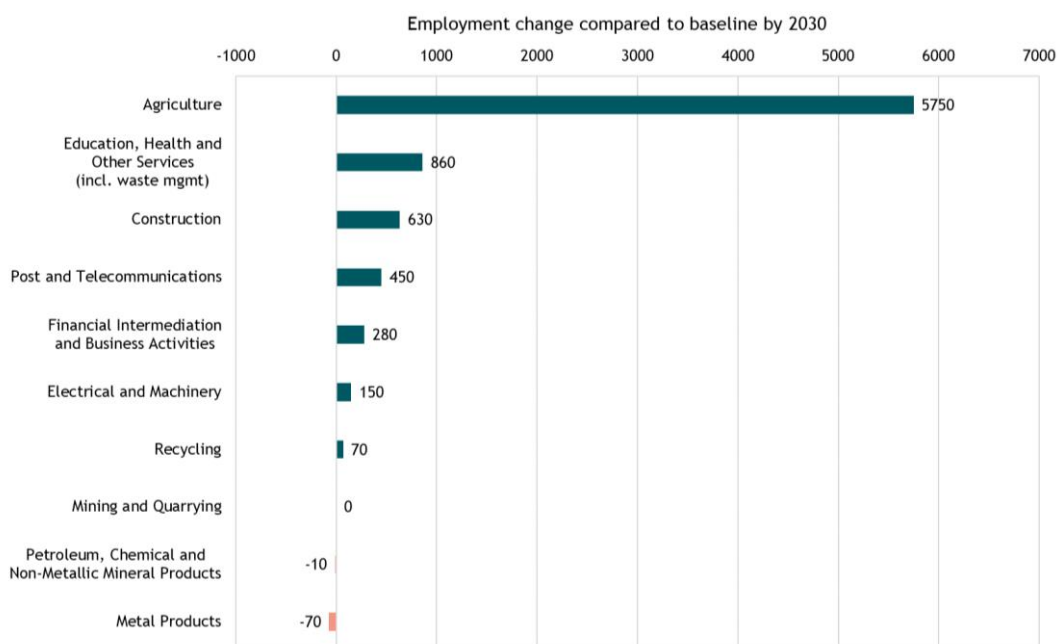
Similarly, these sectors would also increase their intermediate demand for production inputs from their suppliers (including transport and financial and business services). The increasing competitiveness of the agricultural sector would also allow it to export some of its produce, which along with the scenario assumption of increased exports of recycled materials from e-waste, would make a small positive contribution to the trade balance.

Equally, the model suggests that circular economy activity would lead to higher consumption levels, as rising employment in key circular economy sectors (see next section) would lead to higher disposable incomes, and so to greater consumer spending on goods from the retail, education and health, and agricultural sectors. Higher business and consumer expenditure on imports would also dampen the impact of the assumed drop in agricultural and electronics (e-waste) imports: hence the results suggest a smaller impact on imports (-EUR 100m) than would be expected from the size of the assumed fall in imports (-EUR 148m).

When interpreting these economic results, it is important to note that not all of the projected impacts in the CE scenario would necessarily be sustained beyond 2030. On the one hand, we may expect a permanent impact from circular economy activities such as preventing food losses in the agricultural supply chain, or increasing waste collection rates, assuming efforts are made to maintain these practices in the future. On the other hand, some of the projected GDP impacts are a direct result of time-limited injections of funds into the economy, such as the assumed increase in investment in agriculture. We have assumed that half of this investment stimulus would be funded either through public deficits or official development assistance: if this type of funding were to be discontinued from 2030, then we would expect the GDP impact to be somewhat smaller from 2031 onwards.

Social impacts and benefits

In line with the positive economic effects, the circular economy in Senegal would also have positive employment effects. Overall, a net increase in employment relative to the baseline scenario of around 0.15% is projected, or approximately 8,200 additional jobs compared to the baseline (Figure 3-1).

Figure 3-1 Absolute employment changes in selected sectors in CE scenario (relative to the baseline scenario)

In line with the economic impacts, the largest employment impacts in the CE scenario would be seen in the agricultural sector, which accounts for around two thirds of the net employment impacts seen in the modelling results. The higher employment in agriculture relative to the baseline would be a direct consequence of greater circular economy activity in this sector.

These impacts on agricultural employment should be interpreted with caution, however, due to a limitation in the modelling methodology. The employment impacts observed in the CE scenario reflect an implicit assumption that the additional output in domestic agriculture due to prevention of food losses is as labour-intensive as other forms of agricultural production, when in reality it is likely that this circular economy activity would be much less labour-intensive than most agricultural production.

The results suggest that circular economy activity would also have a direct, positive impact on employment in the waste management sector, as output and employment would need to increase in order to meet higher collection rates than in the 'business-as-usual' scenario.

Employment in other sectors would also indirectly benefit from circular economy activity. Increasing investment expenditure in the economy would lead to higher demand for construction, and higher consumer spending levels would lead to greater demand for telecommunication and financial and business services, generating positive employment impacts in these sectors.

However, in order to yield these positive labour impact, strong capacity building and upskilling, including trainings and education, are needed to be implemented. The labour force in the agricultural sector would benefit from capacity building focussing on best practices in the area of irrigation and organic fertiliser. For the waste sector, proper collection and sorting are key, which demand labour trainings in respective techniques. The labour in the construction sector especially requires upskilling measures in field of eco-construction while, overarchingly, digital skills require more attention as well because they will facilitate a shift to product-as-a-service models.

The net employment impact of greater use of recycled materials in construction and electronics, plastics and metals production would be roughly neutral, as gains in employment in the recycling sector relative to the baseline would be offset by a marginally larger decline in employment in the metals and petrochemical sectors.

As explained throughout this report, CE strategies can have important impacts on informal workers. The model is only capable of quantifying changes in overall employment volumes, but not to assess the impacts of specific groups within the workforce in qualitative terms. This means that the shifts in economic activities in this assessment can affect the job types and skill sets required. Involving informal workers in the economic transformation process is thus crucial for achieving societally beneficial outcomes.

Environmental impacts and benefits

Our model suggests that the economic growth seen as a result of circular economy activity in Senegal would produce higher carbon emissions than in the baseline, with CO₂ emissions forecast to be 0.5% higher than baseline levels by 2030¹³¹.

The transport sector, among the most energy- and carbon-intensive sectors in the Senegalese economy, would be responsible for the greatest part of the projected increase in emissions. As circular economy activities generate economic benefits that spread throughout the economy, business and consumer demand for transportation services would increase, leading to greater consumption of fossil fuels. The same can be said of the power generation sector, which would contribute a smaller volume of additional emissions relative to the baseline. For the impacts of circular economy activities to be carbon neutral, Senegal would likely need to take separate measures to ensure that these sectors see higher take up of renewable energy sources.

Smaller CO₂ emissions increases would also be seen from the recycling sector, which would see its output rise as a direct result of greater circular economy activity, as well as from households. This rise in recycling emissions would more than outweigh a corresponding contraction in emissions from the petrochemical and metals sectors, implying that increasing circularity of production would not necessarily reduce the carbon-intensity of production.

It is important to take account of some methodological limitations when interpreting these environmental impacts. Firstly, our modelling likely overestimates emissions impacts from certain circular economy activities, such as in agriculture, as we faced limitations in how accurately we could model these activities. For instance, we modelled the prevention of food losses in the agricultural supply chain as an increase in demand for domestically produced agricultural goods, to substitute for imports of those goods. This implies that preventing a given amount of food losses requires the same amount of energy as growing an equivalent amount of food. As was the case with employment in this sector, however, it is likely that the former is more energy-efficient than the latter as this food was already produced in the baseline case, but no measures were taken to prevent it from being lost. Similarly, the model does not necessarily capture the effect that greater recycling rates would have on reducing landfill emissions, or

¹³¹ These results include only emissions of CO₂ from energy use (such as burning of fossil fuels in transport). They therefore do not take account of emissions of other greenhouse gases (such as methane), nor of emissions of CO₂ from other sources (including emissions from industrial processes, from changes in land use and from landfill). This is due to a lack of reliable data for these emissions at the sectoral level required in this study. As a result, the CE scenario emissions results do not fully capture the climate impacts of CE activities, in particular in the agricultural and waste sectors.

the effect of reduced food losses on organic waste emissions, as our results only include emissions from energy use and process emissions.

Secondly, it should be noted that the results presented here only project the emissions impacts in Senegal, and do not attempt to project the net impact on global emissions. For instance, a substitution of imports for domestic production would, all else being equal, result in no net change in emissions, as production has simply relocated from one place to another. However, this development is represented in our results as an increase in emissions in Senegal, without taking account of any corresponding decrease in emissions outside of its borders.

Thirdly, these emissions impacts should be seen in the context of environmental goals, more broadly defined. For instance, the increase in emissions as a result of circular economy activities must be weighed against the abatement of other forms of pollution, such as that generated by uncollected waste. Economic statistics such as national accounts generally do not capture the broader co-benefits of increasing waste collection output in terms of human health, ecosystem services reduced pollution, resource savings and natural capital.

4 Cooperation between the EU and Senegal

The following sections are meant to map the ongoing relations between Africa and the EU on different levels, and to identify opportunities to further mainstream CE activities within these.

4.1 Policy dialogues

Senegal and the EU have enjoyed a close relationship for more than 50 years. Based on this sustained partnership, dialogues between parties take place on a structured level in regular intervals. Political dialogue is for the most part governed by the Cotonou Partnership Agreement between the EU, EU member states and 79 African, Caribbean and Pacific countries (ACP). To support the implementation of the agreement, which is reviewed every 5 years, The ACP Council of Ministers, assisted by the Committee of Ambassadors is, among others, responsible for conducting political dialogues on national, regional and global issues between the various members, allowing for regular political exchange between the countries' authorities.^{132,133} CE is, however, not particularly addressed within the dialogue framework of the agreement. Sector-specific agreements between the EU and Senegal (such as the recently concluded new implementing protocol to the existing sustainable fisheries agreement) are also not focusing on circular economy¹³⁴.

Collaborative dialogue between Senegal and the EU has also been held under the premise of implementing development funds from the European Development Fund. The allocation of the EDF funds for the period 2014-2020 is defined by two key documents, which have framed the institutional structure of the cooperation between the EU and Senegal from 2014 onwards: the EU-Senegal joint programming document and the National Indicative Programme 2014-2017.¹³⁵ Both documents do not set a clearly defined platform for policy dialogue on the selected intervention sectors. However, there are several

¹³² European External Action Service - European Commission (2020). Senegal And The EU.

¹³³ Eur-lex.europa.eu (2020). EUR-Lex - R12101 - EN - EUR-Lex.

¹³⁴ Fischerei - European Commission (2020). EU Concludes Sustainable Fishing Partnership Agreement Protocol With Senegal - Fischerei - European Commission.

¹³⁵ European External Action Service - European Commission (2020). Senegal And The EU.

recommendations on how to improve exchange. Although it remains unclear to what extent these recommendations have already been successfully implemented, it can be said that no designated platform for circular economy-related exchange has been established to date. In this respect, the forthcoming Team Europe initiative to Promote the Green and Digital Economy in Senegal (PREVERDS), even though at an early drafting stage at the time this report is being finalized, could offer the potential to fill this gap.

In the context of implementing the Plan Senegal Emergent (see Section 2.4), the Senegalese Ministry of Environment has further requested the support of the EU funded Partnership for Action on Green Economy (PAGE) in early 2014. PAGE's work in Senegal is focused around supporting the implementation of the PSE, and, in particular, its five-year Priority Action Plan (PAP 2014-2018). To this end, PAGE brought together a committee – comprising members of Parliament, members of the Economic, Social and Environmental Council (CESE) and local mayors, supported by a team of researchers recruited through PAGE – to produce a National Strategic Guidance Document on Green Economy. By bringing together green economy experts from all levels of government, the committee effectively acts as a mechanism for mainstreaming green economy advocacy and policy expertise throughout the governance structure and serves as a platform for continuous policy dialogue on green economy issues.

In the past, the dialogue between the EU and Senegal on Circular Economy issues has also frequently taken place within the framework of international conferences. The most notable example to this regard was the high-level regional Conference on Circular Economy, Green Industries and Employment in West Africa, which was hosted in Dakar in July 2019 and jointly organised by the United Nations Industrial Development Organisation (UNIDO), the European Commission, the Economic Community of West African States (ECOWAS) and the Republic of Senegal. The conference focused on the importance of green industries and circular business models and how their implementation could contribute to achieving the various goals of the 2030 Agenda for Sustainable Development. After identifying a common basis for an inclined engagement in the circular economy, the participating parties agreed to strengthen their bilateral, regional and international engagement. They also reaffirmed the need to cooperate in the introduction of circular business practices to facilitate the growth of sustainable cities and the development of sustainable infrastructure development. Finally, the parties agreed that intensifying research and innovation partnerships would help disseminate best practice and help synthesise the importance of the fourth industrial revolution in the context of circular economy. As a result of the high-level conference, the EU and Senegal adopted a joint statement outlining possible areas for cooperation, formalised as the “Dakar Pathways to Advance Circular Economy, Green Industries and Jobs in West Africa”.¹³⁶ The following pathways were acknowledged and confirmed:¹³⁷

- The **role of green industries** in improving resource efficiency, while decreasing pollution, creating jobs, driving innovation, diversifying economies, and thus paving the way for the broader transition to a circular economy in the region, and globally. Green industries and circular business models are also contributing to the UN Sustainable Development Goals, which serve as a global benchmark for progress;
- The alarming and increasing levels of waste generation and the challenges it brings puts focus on the potential of **waste as a resource in Senegal**. There is also opportunity to continue dialogues around the role of the informal sector;

¹³⁶ OUDNI (2019). RAPPORT DE LA CONFÉRENCE REGIONALE DE HAUT NIVEAU Economie circulaire, industries vertes et emplois en Afrique de l'Ouest.

¹³⁷ European Commission (2019). Dakar Pathways to Advance Circular Economy, Green Industries and Jobs in West Africa.

- Creating **enabling policy and financial frameworks** and encouraging innovation will facilitate the transition and reduce financial and other barriers that impede innovative, circular business practices. Policy and financial frameworks are also required to support MSMEs (Micro, Small and Medium Enterprises) in pivoting to green business models, and establish new industrial sectors in the broader economy;
- A comprehensive awareness raising campaign that promotes new and sustainable production and consumption patterns through **education at every level** for a better future of our children, youth and society.

Given the strong presidential focus on green business and policy as well as on promoting zero waste ambition, CE is politically prominent in Senegal. However, there is a clear need for clarity on roles and responsibilities, particularly regarding ministerial mandates. Even though a strategy for circular economy is key for Senegal nationally, the local situation remains extremely complex. The mapping exercise above shows that CE has so far not played an important role within the framework of policy dialogues between Senegal and the EU. Nevertheless, based on the existing structures a range of opportunities for future circular economy-related policy dialogues can be identified, listed in Table 4-1.

Table 4-1 Opportunities and Barriers for future policy dialogues between Senegal and the EU

Opportunities and Barriers for future CE-related policy dialogues between Senegal and the EU
<ul style="list-style-type: none"> • Existing sector specific partnership agreements and policy dialogues between the EU and Senegal show significant potential to increase the focus on CE. Furthermore, new partnership agreements replacing the Cotonou Agreement, which will expire at the end of 2020, may be used as a framework for enhanced CE-related exchange. • Existing and ongoing bilateral dialogues (e.g. between France and Senegal) present a good opportunity to guide, expand and improve CE-related policy dialogues between the EU and Senegal. • It is expected that the circular economy will play a more prominent role in the next funding period for EU-Senegal cooperation, as cross-border cooperation and enhanced policy dialogue on circular economy is one of the important elements of the EU Green Deal. Discussions on the thematic focus for the next budget programming period are currently ongoing. • As there is currently a noticeable lack of platforms for continuous CE-related policy dialogues, the establishment of such platform would be an important step towards enhanced policy dialogue between the two parties.

4.2 Development cooperation programmes, including by the EU Member States

Between 2014 and 2020, many development cooperation projects between Senegal and the EU were funded through the European Development Fund and in accordance with Senegal's Development strategy. As a result, most of the implemented development cooperation programmes are strongly aligned with the focus areas defined by the EDF: (1) Strengthening of democratic governance; (2) Foster sustainable agricultural development and food security and; (3) Enhance access to water, sanitation and energy. A fourth priority area of cooperation included the support for civil society.¹³⁸

Despite overlapping with the selected focus areas, circular economy does currently not play a primary role in the institutional framework of development cooperation. However, in light of the recent bilateral exchange on circular economy, an integration of circular economy-related programmes seems like a promising prospect for further joint activities. A first step in this direction might be achieved by three

¹³⁸ European External Action Service - European Commission (2020). Senegal And The EU.

EU-Senegal development programmes signed in 2019, encompassing a total of EUR 27.5 Million in funds. The programmes consist of:

- a support programme for the development of renewable energies (EUR 20 Million) that will improve access to electricity in the most deprived rural areas;
- a support programme for civil society (EUR 4 Million) that will support open and constructive dialogue between civil society, the Senegalese authorities, the private sector and Senegal's partners for the inclusive and sustainable development of the country;
- technical cooperation (EUR 3.5 Million) that will improve the implementation of the EU cooperation programmes with Senegal to facilitate investment and job creation.¹³⁹

In addition, the ongoing discussions on the upcoming programming period of the Team Europe Initiative (TEI) on the Green Economy (2021-2027) show a clear focus on promoting a green and circular economy in Senegal. Among the three priority areas for TE interventions are:

- Sustainable cities and resilient infrastructures;
- Food systems and sustainable agriculture, food security and resilience, biodiversity and ecosystem conservation;
- Digitisation and job creation.

The intervention line "Sustainable Cities and Resilient Infrastructures" sets a particular focus on the improvement of solid waste management as well as the improved support of the private sector for the development of the circular economy.

Development cooperation in Senegal is also financed by individual member states (see Table 4-2). While the member states frequently collaborate with Senegal in joint development activities, the projects are often associated with building up renewable energy capacities, education¹⁴⁰ or supporting governance structures in Senegal. Only a few CE-related projects can be found in the list of bilateral development cooperation. Among them is the AFD sponsored Afric'innov programme, which aims to support MSMEs in their role of creating new innovative business models in over twenty African countries. Another project emerged through collaboration between the AFD, the EU and the Bureau de Mise à Niveau (BMN), aiming to support the development of small and medium-sized enterprises¹⁴¹. While both programmes do not particularly aim to facilitate the rollout of circular or sustainable business models, they do show an affinity for supporting green entrepreneurship.¹⁴²

Many of the development cooperation programmes and projects in Senegal are co-funded by various EU development agencies, which are listed in Table 4-2.

¹³⁹ European Commission (2020). Press Corner.

¹⁴⁰ Euractiv.com (2020). France Steps Up Efforts For Education Aid.

¹⁴¹ EU Emergency Trust Fund for Africa - European Commission (2020). The Enterprise Upgrading Office Of Senegal Supports Job Creation In The Regions Of Departure.

¹⁴² Afd.fr (2020). Afric'innov Project: Supporting The Development Of Innovative Entrepreneurship In Africa.

Table 4-2 Ongoing CE related¹⁴³ EU & Member State funded cooperation projects and programmes in Senegal

Project/ Programme	Launch Date	Current Funding (EUR) Millions
EU - EDF		
Projet d'amélioration de l'accès à l'eau et à l'assainissement dans trois zones rurales du Sénégal « PEPAM-UE »	2013	27.3
Contrat de réforme sectorielle eau et assainissement	2017	15.3
Développement agricole et de la sécurité alimentaire des territoires ruraux du Tiers-Sud du Sénégal "Beydaare"	2017	20.5
Programme de Modernisation du secteur de l'Electricité - EIB	2017	13.3
Intégration des énergies renouvelables dans le réseau-SMART GRID - AFD	2017	7.0
Projet de dépollution de la baie de Hann à Dakar - AFD	2018	14.7
Programme d'appui au développement des énergies renouvelables pour l'accès universel au Sénégal	2019	20
Programme d'implantation et de dissémination de Biodigesteurs dans les zones rurales du Sénégal (PIDB)	2014	7.4
Développement durable par les énergies renouvelables (DPER-Sud Est Senegal)	2014	6.4
AECID - Spanish Agency for International Development Cooperation		
Senegal Solid Waste Management Project (PROMOGED)	2020	295 (contribution)
AICS¹⁴⁴ - Italian Development Agency		
Programme for support to the Economic and Social Development in Senegal	2015	2.5
HEALTH PLUS: Water, Sanitation and Nutrition in the District of Tenghory	2015	1.3
Sustainable development and fair employment in the fishing Sector in Ziguinchor	2014	0.8
LUXDEV - Development Agency of Luxemburg¹⁴⁵		
Developing Employment in Senegal: Strengthening Employability and Business Competitiveness in Departure Areas	2016	19

¹⁴³ Cooperation projects or programmes which cover sectors or include elements that show the potential to promote circular economy approaches in Senegal.

¹⁴⁴ OPENAID (2019). Senegal.

¹⁴⁵ Lux-Development (2020). Republic of Senegal.

Other cooperation projects between Senegal and the EU, which incorporate some of the fundamental aspects of Circular Economy, have mostly been conducted in small-scale waste management projects. A list of said projects is provided below.

Table 4-3 Small Scale Waste management related development cooperation programmes between Senegal and the EU¹⁴⁶

Project	Location	Funding (EUR)	Implementing Partner
Initiative to strengthen governance of sustainable management of municipal solid waste	Louga	147,327	Municipality Louga
Improved management and agricultural application of waste streams	Joal Fadiouth and Mbour	200,000	Municipality Joal Fadiouth
Improved waste management to ensure a healthier living environment	Saint-Louis	100,000	Municipality St. Louis
Cooperation project to implement a participative waste management structure	Ziguinchor	349,500	Municipality Ziguinchor
Wastewater Treatment and processing of municipal solid waste	Rosso	134,974	Municipality Rosso

The mapping exercise above shows that circular economy has so far not played an important role within the framework of development cooperation between Senegal and the EU. Nevertheless, based on the existing programmes and approaches a range of opportunities for future CE-related development cooperation programmes can be identified.

Table 4-4 Opportunities and Barriers for future CE-related development cooperation between Senegal and the EU

Opportunities and Barriers for future CE-related development cooperation between Senegal and the EU
<ul style="list-style-type: none"> • The currently ongoing CE-related EU & Member State funded development cooperation projects (Table 4-3) offer significant potential for the development of CE in Senegal, both in terms of green/circular job creation and the sustainable development of the country. • The forthcoming Team Europe Initiatives in Senegal first and foremost the PREVERDS initiative, yet at an early stage of preparation, could offer great opportunities for coordinated future development cooperation between the EU, EUMS and Senegal in support of a transition towards CE within the country. • Existing project particularly those in the area of waste management, could be extended to increasingly include CE-aspects such as EPR, recycling and reuse • Building on the activities of the AFD, the continued support of green entrepreneurs and SMEs provides a good opportunity to support CE approaches in Senegal in a bottom-up approach.

4.3 Activities by the EIB and European Development Finance Institutions (DFIs)

The following table provides an overview of the major circular economy-related activities on the European Investment Bank (EIB) and other European Development Finance Institutions (DFIs) in Senegal.

¹⁴⁶ EEAS (2020). Projets De Moins D'un Million D'euros (2015-2016).

Table 4-5 EU and EU Member States' DFI- funded CE-related programmes in Senegal, with identified priorities

Organisation	Projects	Priorities
EIB ^{147,148,149,150}	<ul style="list-style-type: none"> The EIB has worked with Senegal since 1966 and has in total invested in 49 infrastructure and climate action projects. The Senegal Water programme was among the earliest water programmes which were operated in partnership with SONES. It was signed in 2007 and primarily aimed at improving the provision of drinking water for urban dwellers in the inland part of the country and in the suburbs of Dakar. Besides creating 25 new boreholes and increasing the supply network by 500 km, the construction of a water treatment plant was another important part of the project. Further the existing network was modernized to a more efficient state while substantially reducing losses. Two additional water-related projects followed in 2016, one of which was also implemented in cooperation with SONES. It concerned the construction of a water treatment plant with a capacity of 100,000 m³ per day, which considered an extension to 200,000 m³ per day by 2025 as well as a delivery and transport line for approximately 210 km between Lac de Guiers and Dakar.¹⁵¹ The other project aimed to construct an irrigation system of 4,500 ha for rice plantation near Saint-Louis in Northern Senegal. A masterplan for sustainable water resource management was used from the previously implemented Senegal water programme. 	<ul style="list-style-type: none"> A focus area of their work is the access to electricity in general and to affordable solar power in specific as well as building infrastructure for sustainable urban transport. Together with SONES Société Nationale des Eaux du Sénégal), the national water company in Senegal, the EIB has moreover improved the access to safe water in Dakar and other urban centres across the country.
AFD	<ul style="list-style-type: none"> Starting in 2008, the AFD has engaged in a project addressing the issue of industrial wastewater management in the Hann Bay Area close to Dakar. The background of the project was that, due to a lack of facility for waste treatment, many of the companies located along the bay discharge both liquid and solid waste directly into the sea without any treatment. As a result, the region had to struggle with serious social, economic and environmental issues as well as negative health effects, such as the spread of infectious diseases among the local population. The project aimed to restore the bays water quality by dealing with 95% of the bacterial pollution on a sustainable basis, not only protecting the marine environment but improving the health of the approximately 55,000 people living along the Bay. Additional loans by the EU and other DFIs such as the Dutch RVO are used to provide institutional support for the authorities in their negotiations with industrialists, convincing them to cover part of the cost of the waste treatment facilities. Together with the Senegalese authorities the AFD was mainly engaged in developing an action plan providing for the remediation of 	<ul style="list-style-type: none"> Since 1947 Senegal has been a long-standing partner of AFD, which places its full range of financial instruments at the service of local economic and social development actors to support the development of jobs and sustainability¹⁵⁶. Water related projects have emerged as a major focus area of AFD.

¹⁴⁷ EIB (2007). Senegal Water Programme.¹⁴⁸ EIB (2016). KMS 2 - Approvisionnement en Eau de Dakar.¹⁴⁹ EIB (2014). Senegal river valley rice.¹⁵⁰ EIB (2008). Dakar Sanitation.¹⁵¹ ibid.¹⁵⁶ Agence française de Développement (2019). Depollution de la baie de Hann.

Organisation	Projects	Priorities
	<p>industrial and domestic liquid discharges, based on various studies concerning industrial pollution, a technical scheme for collection, transport and treatment of industrial and domestic water and the rehabilitation of a rain drainage channel¹⁵².</p> <ul style="list-style-type: none"> As floods remain a frequent threat for the most vulnerable populations of Senegal, the AFD has also been active in flood management. Especially Dakar's periphery is affected by floods on an almost annual basis - but other urban centres like Kaolack, Saint Louis, Diourbel or Bakel are also affected. To fight against the floods and increase the efficiency of planned drainage infrastructure and urban ecosystems in Senegal, AFD engaged in the development of an integrated flood management policy. For its implementation, AFD has mobilized a subsidy from the Green Climate Fund, the financial arm of the United Nations Framework Convention on Climate Change, created in 2010 to finance projects to mitigate and adapt to climate change in developing countries.¹⁵³ While Dakar is preparing to host the World Water Forum in March 2021, AFD is also supporting Senegal in the implementation of its water and sanitation policy, via a public policy loan. Currently, Senegal faces many challenges that condition the achievement of their set goals in a Sector Policy Letter for the period of 2016-2025, which included an ambitious water and sanitation policy reform. Especially the targets for sanitation have not been reached, even though the Sustainable Development Goals (SDGs) adopted at international level introduce new requirements concerning the water quality and sustainability. AFD wished to support the countries process of achieving their targets with a public policy loan dedicated to the water and sanitation sector¹⁵⁴. Further, the construction of a drinking water treatment plant which should ensure the supply of drinking water to the Dakar region by 2025 is supported by the AFD. The strong demographic growth in recent years has led to the saturation of production and transfer capacities as well as the absence of sufficient local drinking water resources. Currently, almost a million people in the capital suffer from insufficient access. In order to cover water needs, the Dakar region water resource mobilization master plan for 2011 identified a work programme for the period of 2013 to 2024. This programme plans to expand the capacity of the ALG system and the Keur Momar Sarr drinking water treatment plant.¹⁵⁵ 	
Kreditanstalt für Wiederaufbau (KfW)	<ul style="list-style-type: none"> The Water supply Dakar IV programme was part of the World Bank's Urban water supply Dakar component, which aimed to improve access to water and sanitation services in selected urban areas in a financially sustainable manner. Six international and local financiers 	<ul style="list-style-type: none"> Since Senegal has committed to introducing major reforms in their national Development Plan, the KfW has entered

¹⁵² Agence française de Développement (2019). Appuyer une gestion intégrée des Inondations au Senegal.

¹⁵³ Agence française de Développement (2018). Accompagner le Senegal dans la mise en Oeuvre de sa Politique de l'eau et de l'assainissement.

¹⁵⁴ Agence française de Développement (2016). Renforcer l'accès à l'eau potable dans la région de Dakar.

¹⁵⁵ l'accès à l'eau potable dans la région de Dakar.
Agence française de Développement (2016). Senegal.

Organisation	Projects	Priorities
	<p>were engaged, with the World Bank taking on the leading role. The KfW's priority areas focused on securing an ecologically sustainable water supply in the greater Dakar region. Part of the collection and transportation capacity between Lake Guiers and Dakar was co-financed in this project by the German financial cooperation.¹⁵⁷</p> <ul style="list-style-type: none"> • Another KfW project encompassed the construction and rehabilitation of water supply facilities in eleven towns. It covered the regions of Fatick, Kaffrine, Kaolack, Kolda, Thiès and Ziguinchor, and included the construction of Senegal's first fluoride filtration plant in Thiadiaye.¹⁵⁸ • Six more cities Richard-Toll (including Rosso), Dagana, Podor, Matam, Bakel and Keïdougou were targeted with a water supply project that comprised the rehabilitation and extension of the central water supply systems in order to sufficiently supply the population of these cities with drinking water.¹⁵⁹ 	<p>into a partnership with the country.</p> <ul style="list-style-type: none"> • Its activities mainly focused on financing projects in the sectors of vocational training, land reform and promotion of small and medium-sized enterprises on behalf of the German Federal Government. • However, KfW also supports projects in the priority sectors of renewable energy sources and energy efficiency.¹⁶⁰ • Three CE-related projects co-financed by the KfW concerned the development of sustainable water networks.

DFI's activities in Senegal currently show a strong focus on improving the national water management. Although none of these activities has a specific focus on supporting the development of a circular economy, they do address certain aspects that already contribute to circularity and may therefore serve as a basis for future investments in circular economy related projects. The following table list opportunities and barriers for facilitating future DFI investments in CE-related projects in Senegal.

Table 4-6 Opportunities and barriers for future CE-related activities of EU-DFIs in Senegal

Opportunities and barriers for future CE-related activities of EU-DFIs in Senegal
<ul style="list-style-type: none"> • Building up the capacity of local financial institutions by providing additional DFI financing offers great opportunities for the scale-up of ongoing investments in local green industries and wider circular economy activities. • The EIB's has recently launched its new global climate strategy and Energy Lending Policy. The new strategy will end financing for fossil fuel energy projects from the end of 2021 and instead focus on accelerating clean energy innovation, energy efficiency and renewable energies. Under the strategy, the EIB Group financing will unlock EUR 1 Trillion of climate action and environmentally sustainable investment in the decade to 2030. This offers significant potentials for the financing of future climate- and environmental-friendly CE projects in both Europe and Africa.

4.4 CE-related trade and investments in Senegal

Given its geographical location Senegal is one of the most industrialised countries in Africa, attracting a variety of trade partnerships, particularly strong with French-speaking countries. While in 2010, the country's environmental goods and services sectors accounted for 4% of the total trade volume this share

¹⁵⁷ KfW (2011). Ex post-Evaluation Brief, Senegal: Water Supply in Regional Towns.

¹⁵⁸ KfW (2007). Senegal: Water Supply in Six River Cities.

¹⁵⁹ KfW (n.d.). Senegal.

¹⁶⁰ KfW (2016). Ex post evaluation - Senegal.

steadily increased to 7% in 2016. Trade in environmental goods and services is limited to imports, where renewable energy technologies, water treatment technologies and waste management systems have accounted for the largest part of the imports in the period 2010-2013 while renewable energy technologies and cleaner / more resource efficient technologies and products have dominated in the period 2014-2016¹⁶¹. The Emergent Senegal Plan, which came into effect in 2012, drives local investment in infrastructures for greening the country. This explains the upward trajectory of trade in environmental goods and services. The countries top export goods remain mineral fuels, precious metals, fish, inorganic chemicals and ores.¹⁶²

Senegal is a founding member of the WTO (in 1995) and in addition part of the Economic Community of Central African states (ECCAS), the West African Economic and Monetary Union UEMOA and the Community of West African States (ECOWAS), which in 2014 negotiated a regional economic partnership agreement (EPA) with the European Union (EU).¹⁶³ Negotiations of the regional EPA covering 16 countries in West Africa were concluded on the 30th of June 2014. Except for Nigeria, All EU Member States and West African Countries have signed the EPA. After signature by all the Parties, the agreement will be submitted for ratification.¹⁶⁴ Until the regional EPA is signed and ratified, Senegal has non-reciprocal preferential access to the EU market under the "Everything But Arms" initiative.

Despite the advanced regional integration processes, barriers to intra-regional trade remain a challenge for the Senegalese economy as the trade-weighted average tariff rate remaining relatively high at 8.9%, and non-tariff barriers (e.g. complex and lengthy custom clearance) increase the cost of trade. Senegal furthermore applies the common external tariff of ECOWAS with five tariff rates: 0% for basic consumer goods, 5% for raw materials and capital goods, 10% for intermediate products, 20% for finished goods and 35% for sensitive goods. Temporary special taxes are levied on certain agricultural products. Certain foods, beverages, tobacco products, cosmetic products as well as fuels and motor vehicles are subject to excise duty. Additional taxes are levied on alcoholic beverages, mining and quarry products, and cement.¹⁶⁵

In the recent years Senegal has increasingly imported electronic waste and electrical equipment. The rapid growth of e-waste in Senegal is causing some alarm, with reports predicting that by 2020, the country is expected to experience a four to eight-fold increase in e-waste from computers alone (compared to 2010). As of 2017, no National regulation was in force concerning e-waste imports.¹⁶⁶ This problem is further exacerbated, as Senegal is one of the main destinations for illegal waste trafficking.¹⁶⁷ In addition to e-waste, trade in second-hand clothing has become a highly visible phenomenon especially in the informal markets of Dakar. The principal countries of origin of these imports are the United States, Italy, France, Turkey, Belgium, and Germany. While the markets of these clothes have created many jobs, the unregulated and uncontrolled imports of used clothes are considered to contribute to the decline of Senegal's textile and clothing industry.¹⁶⁸ Among the note-worthy environmental goods exported by Senegal are ball-bearings, which are often used as components in the manufacture of larger climate-friendly technologies such as wind-turbines.¹⁶⁹

¹⁶¹ OECD - Trade in Environmental goods and services.

¹⁶² Workman, D. (2020). Senegal's Top 10 Exports.

¹⁶³ Intracen.org (2020). Senegal.

¹⁶⁴ European Commission (2020). OVERVIEW OF ECONOMIC PARTNERSHIP AGREEMENTS.

¹⁶⁵ Gtai.de (2020). Basiswissen Einfuhr In Senegal | Zoll Und Einfuhr Kompakt | Senegal.

¹⁶⁶ Balde, C. P. (2017). The Global E-Waste Monitor.

¹⁶⁷ UN Environment (2018). The State Of Knowledge Of Crimes That Have Serious Impacts On The Environment.

¹⁶⁸ Oxfarm (2005). The Impact Of The Second-Hand Clothing Trade On Developing Countries.

¹⁶⁹ N.a. (2009). Liberalization Of Climate-Friendly Environmental Goods: Issues For Small Developing Countries.

To scale up the mobilization of private capital towards environmentally sustainable investments, Senegal has also joined the International Platform on Sustainable Finance (IPSF) in 2020. The IPSF provides a multilateral forum for dialogue between policy makers responsible for developing regulatory measures in the field of sustainable finance to help investors identify and take advantage of sustainable investment opportunities that truly contribute to climate and environmental goals. Through the IPSF, members can exchange and disseminate information to promote best practice, compare their various initiatives and identify obstacles and opportunities for sustainable finance, while respecting national and regional contexts. Where appropriate, members can make further efforts to align their initiatives and approaches.¹⁷⁰

The mapping exercise above shows that circular economy is not yet the focus of the trade and investment in environmental goods and services in Senegal. Nevertheless, the existing structures offer a range of opportunities to address these gaps in the future.

Table 4-7 Opportunities and Barriers for trade and investment in environmental goods and services

Opportunities and Barriers for future trade and investment in environmental goods and services
<ul style="list-style-type: none"> Judging by the balance of trade between Senegal and the EU, there is significant potential for increasing Senegalese exports to the European market. Within this context, the Economic Partnership Agreement (EPA) between the EU and the ECOWAS could – once signed by all ECOWAS members and ratified – help Senegal to better take advantage of its potential, by contributing to its sustainable economic and commercial development. In case the ratification of the regional EPA with ECOWAS is further delayed, the implementation of an individual EPA may further help to focus on restricting the import of e-waste, second-hand clothing, and waste-plastics, which contribute to the growing waste problem in Senegal, while aiming to establish preferential tariffs for the trade of environmentally friendly goods and technologies. The development and improvement of platforms such as the International Platform on Sustainable Finance could particularly facilitate the mobilisation of capital towards investments in CE-related goods and services as well as the exchange of CE-related knowledge.

4.5 EU companies with circular economy operations in Senegal

The following table provides an overview the most relevant EU companies with CE-related operations in Senegal.

Table 4-8 EU companies with circular economy operations in Senegal

Aventurin ¹⁷¹ (Germany)
The German based company Aventurin considers itself a CE Social Business. It operates a facility, which transforms plastic waste back into oil to enable the circular economy mainly through using technology from the Biofabrik a German technology provider. Other materials the company targets cover paper and organic waste. The produced raw material is sold, and the resulting revenue is used to cover the cost of the facility. As part of the company's concept, Aventurin pays Senegalese waste collectors in exchange for plastic waste. With the surplus revenue they claim to support environmental education for dealing with waste, especially among children.
Eiffage ¹⁷² & RéaVie ¹⁷³ (France)
The French construction engineering company Eiffage with its subsidy Eiffage Senegal already engaged in the construction of the Keur Momar Sarr drinking water plant as introduced above, a project jointly financed with a loan

¹⁷⁰ European Commission (2020) International platform on sustainable finance.

¹⁷¹ Aventurin (2020). Establishing a value chain for plastic waste.

¹⁷² Afrik21 (2020). Senegal: AFD completes existing loan for Dakar drinking water project.

¹⁷³ EIFFAGE (n.d.) Circular Economy.

by the World Bank, the African Development Bank (AfDB), the Islamic Development Bank (IDB) and the European Investment Bank (EIB). Their work package mostly concerned the laying of 38 kilometres of 1,500 mm diameter ductile iron pipes.

As part of the company's foundation, Eiffage launched a "Best of the circular economy" competition in 2018 to encourage the initiatives receiving support in the foundation to share best practices internally. RéaVie, a non-profit's circular economy platform was one of the foundations initiatives that participated. It saved several tonnes of material and equipment from being sent to landfill and has equipped the University of Dakar with furniture recovered from the French eco-neighbourhood LaVallée.

Geolhyan¹⁷⁴

Geolhyan supports project by assessing potential sources of pollution, health and environmental risks, and it proposes remediation as well as depollution solutions while also supporting the implementation of sustainable water management solutions. The company addresses the challenges of preserving the coastal marine environment in Senegal with a range of services including various analyses as part of initial or in-depth studies. Geolhyan further engages in waste management projects through landfill diagnostics of storage sites, environmental impact studies and it performs various air quality audits.

PV Cycle¹⁷⁵ (Belgium)

Founded by and for the PV industry in Europe, PV Cycle considers itself a key player in European PV waste management. PV CYCLE offers national waste management and legal compliance services for a variety of products – including electrical and electronic equipment, PV modules, batteries, packaging, production and industrial waste – as well as tailor-made solutions for internationally operating companies.

The organization has demonstrated its capability in the international PV waste management sector by collecting and processing more than 25 tons of end-of-life PV modules from Senegal. These modules are treated mainly with mechanical processes, including grinding, sorting and refining, etc, which have been proven as the most feasible and cost-efficient recycling solution for photovoltaic waste, according to the company.

Saur¹⁷⁶ (France)

Similar to Eiffages activities in Senegal, Saur or more specifically its subsidiary Stereau was appointed by the Senegalese water company SONES to support water management projects around Dakar. Their main task involved the drilling of boreholes and construction of an 800 m³/hour pumping station at Thiaroye on the outskirts of Dakar. These new facilities are designed to significantly improve living conditions for local residents, whose densely populated community is regularly flooded as a result of rising levels in the Thiaroye aquifer. Further they were involved in the extension and upgrade of the Cambérène wastewater treatment plant in Dakar. By enabling the treatment of up to 15% of the city's wastewater, the plant was designed to absorb the region's demographic growth and meet the stated commitment of the Senegalese authorities to put in place the environmental infrastructures required by a country that is also a major tourist destination. According to Saur, the re-use of treated wastewater is able to significantly reduces the pressure on water resources, while at the same time as cutting greenhouse gas emissions. The plant is also equipped with a sludge digester facility, whereas the biogas generated by the digestion process is then used to generate 30% of the plant's electricity needs.

Veolia¹⁷⁷ (France)

The French company Veolia used to perform a variety of waste management processes in Senegal including waste collection and disposal. In addition, a subsidy of Veolia has been awarded the contract to design and build an iron removal water treatment plant for Senegal's water utility SONES.¹⁷⁸ Veolia's tasks covered the construction of an iron removal treatment plant, since some of the city's water comes from boreholes with high iron content. The treatment will consist of raw water aeration, physical-chemical treatment and sand filtration.

¹⁷⁴ Mballo, D. (2015). Geolhyan se met au Coeur du developpement durable.

¹⁷⁵ PV Cycle (2016).

¹⁷⁶ SAUR (2020). SAUR worldwide.

¹⁷⁷ Kimbi Yaah, V. B. (2018). Improvement of the Waste Management System in Senegal.

¹⁷⁸ Veolia (2017). Veolia to design and build water treatment plat in Dakar, Senegal. Press release: Africa - Municipal Water. Paris - Dakar. Veolia (2017). Veolia to design and build water treatment plat in Dakar, Senegal. Press release: Africa - Municipal Water. Paris - Dakar.

Advancing CE-related activities of EU businesses and business associations within the country can play an important role and advancing the rollout of a CE in Senegal. The following table list some of the opportunities and barriers with regard to advancing this potential in the future.

Table 4-9 Opportunities and Barriers for advancing CE-related activities of EU-companies in Senegal

Opportunities and Barriers for advancing CE-related activities of EU-companies in Senegal
<ul style="list-style-type: none"> • The business Forum which is organised in the margins of the upcoming AU-EU Summit (postponed to 2021) can potentially form the basis for enhancing cooperation, dialogue, business partnerships along critical value chains, as well as the deepening of Economic Partnership Agreements, and other EU trade agreements with African partner countries. • The development and improvement of platforms such as the Sustainable Business for Africa Platform and the International Platform on Sustainable Finance could particularly facilitate the access to finance, the cooperation between companies, as well as the exchange of CE-related knowledge. • Future CE-related activities of EU-companies in Senegal would particularly benefit from continued efforts to promote regulatory reforms, strengthened institutional capacities of public authorities, business organisations and entrepreneurs, as well as easier access to markets and finance.

4.6 Research and technical cooperation

Research and technical cooperation between Senegal and the EU are currently lacking a formal agreement that sets the framework for continuous joint activities in the field. Senegal has been included in previous cooperation initiatives, which were implemented in order to establish and nurture the scientific exchange network between European and African researchers. The foundation block coordinating the exchange on science and technology stems from the Coordination and Advancement of Sub-Saharan Africa-EU Science & Technology Cooperation Network (CAAST-NET) project, initiated in 2008. The project, in which Senegal was represented by the Ministry of Higher Education, Research and Innovation, helped to establish a scientific network between African and European researchers and scientists and created valuable linkages to other EU-Africa research initiatives.¹⁷⁹ Senegal was also part of the following research initiative, the CAAST-NET PLUS. Additionally, Senegal participated in several Long-Term Joint EU-AU Research and Innovation Partnerships on such topics as Renewable Energy¹⁸⁰ and Sustainable Agriculture^{181,182}. However, circular economy has not yet been included as a component of joint research efforts. Nevertheless, during the High-Level Regional Conference on ‘Circular Economy, Green Industries and Jobs in West Africa both the EU and the ECOWAS community agreed upon intensifying research and innovation partnerships in order to address this gap.¹⁸³

On the 30th November 2018, the European Commission and the EU delegation in Senegal also organised an information event and training on Horizon 2020 in Dakar. The event was opened by the Senegalese Minister of Higher Education and Research, Professor Mary Teuw Niane, and brought together over 120

¹⁷⁹ CORDIS - European Commission. Coordination and Advancement of sub-Saharan Africa-EU Science & Technology Cooperation Network.

¹⁸⁰ CORDIS - European Commission (2018). PREparing for a Long-Term Joint EU-AU Research and Innovation Partnership on Renewable Energy.

¹⁸¹ CORDIS - European Commission (2018) Support to the implementation of the Long-term EU-AU Research and Innovation Partnership for Food and Nutrition Security and Sustainable Agriculture.

¹⁸² *ibid.*

¹⁸³ European Commission (2020). Dakar Pathways To Advance Circular Economy, Green Industries And Jobs In West Africa.

representatives of the country's scientific, humanitarian and business communities. Participants were informed about the current and upcoming calls under the Horizon 2020 – Work Programme 2018-2020 for Africa, as well as about further cooperation opportunities under the European Innovation Council's Horizon Award for Affordable High-Tech for Humanitarian Aid.¹⁸⁴

Besides the government-led projects, smaller, individual research projects are the most frequently implemented forms of joint efforts in the fields of science, technology, and innovation. The following table gives an overview of CE-related research and technical cooperation projects, which were implemented together with Senegalese actors or featured participating research institutes from Senegal.

Table 4-10 CE-related research projects in Senegal

CE Related Research Projects	Partnering Research Institution	Research Initiative
Policy research ¹⁸⁵ to identify conditions for optimal functioning of the Senegal river ecosystem in Senegal	Royal Tropical Institute (NL)	FP5-INCO 2
African monsoon multidisciplinary analysis ¹⁸⁶ – re-enforcing the regional environmental monitoring systems and conducting intensive field campaigns	Centre National De La Recherche Scientifique (CNRS)	FP6-SUSTDEV
Co-innovations across scales to enhance sustainable intensification, resilience, and food and nutritional security in water-managed agricultural systems in West Africa ¹⁸⁷	Institut de recherche pour le développement IRD (France); Centre de coopération internationale en recherche agronomique pour le développement CIRAD (France); Wageningen University, The Netherlands; Mediterranean Agronomic Institute of Bari (Italy) Institute for Sustainable Agriculture at Consejo Superior de Investigaciones Científicas (Spain)	WAGRINNOVA
Analysis of the current situation regarding Integrated Waste Management in four targeted countries including Senegal and Ivory Coast, identifying main gaps and selecting suitable management systems ¹⁸⁸	Verein Zur Forderung Des Technologietransfers An Der Hochschule Bremerhaven E.V. (Germany)	FP7-ENVIRONMENT
Use of Biotechnology for Africa's sustainable water supply ¹⁸⁹	Verein Zur Forderung Des Technologietransfers An Der Hochschule Bremerhaven E.V.	FP7-KBBE
Network for the development of sustainable approaches for large-scale implementation of sanitation in Africa ¹⁹⁰	Verein Zur Foerderung Des Technologietransfers An Der Hochschule Bremerhaven E.V.	FP6-SUSTDEV
Western Africa biowastes for energy and fertiliser (WABEF) ¹⁹¹ : Capacity building project focused on the most effective ways	Agricultural research centre for development (CIRAD)	ACP-EU Cooperation Programme for

¹⁸⁴ EU Science & Innovation - European Commission (2020). Horizon 2020 In Senegal.

¹⁸⁵ European Commission (2003) Policy research to identify conditions for optimal functioning of the Senegal river ecosystem in mali, mauritania and senegal.

¹⁸⁶ CORDIS - European Commission. African monsoon multidisciplinary analysis.

¹⁸⁷ LEAP-Agri (2020).

¹⁸⁸ CORDIS - European Commission. INTEGRATED WASTE MANAGEMENT IN WESTERN AFRICA.

¹⁸⁹ CORDIS - European Commission. BioTechnology for Africa's sustainable water supply.

¹⁹⁰ CORDIS - European Commission. Network for the development of sustainable approaches for large-scale implementation of sanitation in Africa

¹⁹¹ Wabef.cirad.fr (2020).

CE Related Research Projects	Partnering Research Institution	Research Initiative
to recycle organic residues and produce energy and fertilisers in West Africa		Science and Technology

CE has so far not played a significant role within the framework of research and technical cooperation between Senegal and the EU. Nevertheless, based on the existing structures a range of opportunities for future CE-related cooperation can be identified, as listed in Table 4-11.

Table 4-11 Opportunities and Barriers for future CE-related research and technical cooperation between Senegal and the

Opportunities and barriers for future CE-related research and technical cooperation between Senegal and the EU
<ul style="list-style-type: none"> • The results of the meeting between the European Commission and the Senegalese Minister of Higher Education and Research, Professor Mary Teuw Niane, to identify opportunities for research cooperation between the EU and Africa under Horizon 2020 could be used to initiate further CE-related cooperative research projects under Horizon 2020 in Senegal. • Research and technical cooperation between Senegal and the EU are currently lacking a formal agreement that sets the framework for continuous joint activities in the field. • Intensifying research and innovation partnerships between the EU and Senegal could facilitate the transfer of environmentally sound and socially inclusive technologies as well as the role of the Fourth Industrial Revolution as a major enabler for green industries and circular economies. In this context, digitization in particular is playing an increasingly important role and must be taken into account in future research cooperation projects.

5 Recommendations

Throughout the report, we have provided an overview on the status of the circular economy in Senegal with a focus on priority sectors in the Senegal policy context and that also coincide with the circular economy priorities in the EU Circular Economy Action Plan.

5.1 General findings and recommendations

Coordination and alignment between government departments

To support a circular transition, coordination and alignment between government departments is needed. To have a concerted impact, several governmental departments will need to be engaged with, for example, the Federal Ministry for the Environment and Sustainable Development, Ministry for Agriculture and Rural Infrastructure and Ministry for Finance and the Budget. Integration of state and local role-players is key, particularly in complex sectors such as waste management. Coherent strategic planning can facilitate implementation of circular economy concepts on federal, state and local levels. International cooperation can enable knowledge sharing and policy dialogues for enrichment of Senegalese growth potential.

Capacity building

In order to support local value chains, robust capacity building measures need to be implemented. Capacity building and skills development need to be focused on circular and green industries to develop local capacity in the necessary fields such as irrigation solutions for the agricultural sector, digital skills that will facilitate a shift to product-as-a-service models, and skills for the emergent eco-construction industry.

- Vocational training frameworks exist. These need to be strengthened to up-skill people for jobs in the circular economy. Engagement with successful programmes already developed in the EU, with some local context and customisation, should help accelerate the transition. Strong focus on digital skills for circular economy entrepreneurship and sustainable consumption;
- Exchange programmes and vocational building programmes with the EU and its Member States should help accelerate this process;
- Private sector-led apprenticeships can ease access to industries that are emerging and may not have established academic institutions offering relevant training. This is a role that EU multinationals with a local presence can play;
- Technical and academic cooperation between Senegal and the EU, including the sharing of innovations and technologies is necessary for adoption of imported technologies and services. There is also a need to strengthen academic institutions by collaborative research activities that showcase local innovations supported by international institutions;
- Projects, particularly in rural areas, need to be coupled with capacity building to empower communities to sustain development, as well as broader awareness and environmental education that will support buy-in. There is also scope to empower one community to act as "mentor" to others, which will allow projects to scale by community enforcement.

5.2 EU - Senegal Cooperation

Strengthening policy dialogues

Currently, few structures have been put in place to facilitate dialogue related to the development of the circular economy. Moreover, the term circular economy is not commonly used and known, including in projects related to the reuse of materials. Lack of terminology use isolates the related projects, thus undermining their effectiveness and potential for widespread use.

- Promoting the term circular economy would make help to define a guiding line in the various initiatives set up by both European and international actors;
- The term circular economy must be generalised in all the sectors it encompasses, whether it be for the creation of green jobs, the improvement of waste management, the implementation of more responsible agricultural techniques, etc.;
- Existing sector-specific partnership agreements and policy dialogues between the EU and Senegal show significant potential to increase the focus on CE. Furthermore, new partnership agreements replacing the Cotonou Agreement, which will expire at the end of 2020, may be used as a framework for enhanced CE-related exchange;
- As there is currently a noticeable lack of platforms for continuous CE-related policy dialogues, the establishment of such platform would be an important step towards enhanced policy dialogue between the two parties. There is a need to set up a platform for continuous circular economy-related policy dialogues and those that target and engage the private sector in Senegal, using chambers of commerce as a vehicle for embedding circular economy principles. The EU could play a role advocating for legislative changes to address regulatory changes and needs. The enabling environment created by supportive policy and legislature can drive opportunities beyond concept to scalable implementation;
- Following up on successful international conferences on CE to further support the dialogue on both a formal and informal level. Future missions should aim to involve all EU Member States represented in Senegal so that CE activities can be jointly coordinated, through the Team Europe approach.

Successful development cooperation projects and programmes

- Integrating circular economy principles into European development cooperation programmes. The newly signed development cooperation projects offer significant potential for the development of circular economy in Senegal, both in terms of green/circular job creation and the sustainable development of the country;
- Given that the joint programming efforts for the period beyond 2020 are soon to be developed, it appears advisable to strengthen the position of CE as a central pillar for EU-Senegal relations. Since circular approaches bear clear economic rationales, it is recommended that upcoming programming efforts establish a link to national development plan objectives of the Emerging Senegal Plan (PES) or the country's strategic framework on the green economy (see chapter 2.3.1). As a transition towards a CE can make a valuable contribution to the building of an industrialized, inclusive and resilient economy, it presents an excellent opportunity for further strengthening the position of CE in bilateral development cooperation plans;
- Existing projects particularly those in the area of waste management, could be extended to increasingly include CE-aspects such as EPR, recycling and reuse;
- Building on the activities of the AFD, the continued support of green entrepreneurs and SMEs provides a good opportunity to support CE approaches in Senegal in a bottom-up approach;
- Strengthen bilateral institutional development and partnership agreements linked to CE.

- Effective development cooperation for a transition towards CE requires the local workforce to obtain skills and knowledge necessary to adapt and continue applying new techniques and technologies imported from the EU. For this reason, the population, especially young people and women, who are the most disadvantaged in the labour market, must be trained in the new techniques and skills that are being introduced;
- The currently ongoing CE related EU & Member State funded development cooperation projects (Table 4-3) offer significant potential for the development of CE in Senegal, both in terms of green/circular job creation and the sustainable development of the country. Future cooperation projects should build upon the basis provided by these projects while simultaneously aiming to strengthen the focus on CE, particularly in the country's priority sectors.

5.2.1 Effective cooperation with the European Investment Bank (EIB) and other European Development Finance Institutions (DFIs)

Future DFI financing should particularly focus on building up the capacity of local financial institutions. This offers great opportunities for scaling-up ongoing and future investments in local green industries and wider circular economy activities, which otherwise would fall out of the DFI investments scope due to their relatively small investment size and risks involved. This can be aligned to priority sectors identified in the EIB's global New Climate Strategy which would ease access to funding for critical interventions pertaining to CE.

5.2.2 Advancing trade and investments in environmental goods and services between the EU and Senegal

Senegal can be supported by the EU in the formulation of harmonized regulations and/or criteria on what constitutes an environmental good or service, and a preferential regime for them (e.g. custom duty exemption, green tax). This issue could be enhanced through the framework of the Africa Continental Free Trade Area (AfCFTA).

- The EU may decide to launch a review of the EPA or even the formulation of a new EPA with Senegal. In case this idea is taken forward, it is recommended to examine the trade relation from a CE-angle, e.g. by asking evaluators to specifically look at goods and services with particular importance for closing material loops and increasing resource efficiency in Senegal and the EU respectively, but also considering import restrictions of products like waste-plastic that contribute to the growing waste problem in Senegal.
- Additionally, the new Africa Continental Free Trade Area (AfCFTA) could help reinforce transparency mechanisms such as quality control and standardization related to the trade of secondary materials in Africa.

5.2.3 Creating a supportive environment for EU / African companies with circular economy operations in Senegal

- Rather than building new platforms from scratch, existing forums, like the Europe-Africa Business Forum or the Sustainable Business for Africa Platform, can be leveraged to form the basis of developing a supportive environment for companies with CE operations in Senegal. These forums can enhance cooperation and the exchange of CE-related knowledge between partners along the value chain. They also offer the opportunity to strengthen existing initiatives by facilitating access to markets and finance.
- There is the opportunity for the EU to engage on knowledge sharing and development of an EPR process that takes the local landscape into account. European models for EPR could be replicated in Senegal with adjustments to match the local culture, waste management system and practices, including process for inclusion of the informal sector.

- Senegal can focus efforts on capacitating local manufacturers for designing for end of life, upskilling people for employment in waste management and awareness raising for the wider community regarding waste generation and separation at source.

5.2.4 Advancing research and technical cooperation between the EU and Senegal

- Partnerships between European and Senegalese universities must be established to facilitate the sharing of skills and knowledge. This will also enable these institutes to develop their research in a manner adapted to the country. The Institute of Science in Senegal is already heavily involved in many projects set up by the EU, this can be broadened to include other institutions of higher learning.
- Intensifying and formalizing research and innovation partnerships between the EU and Senegal could facilitate the transfer of environmentally sound and socially inclusive technologies. However, the flow of knowledge should not be unilateral, key to progress-making is a focus on knowledge sharing.
- Digitalisation plays an increasingly important role and must be considered in future research cooperation projects. The digital divide should be addressed when research affects marginalised communities and the opportunities of advancing technologies for cleaner production and waste minimisation.

5.3 Sector-specific recommendations

Table 5-1 Sector specific recommendations

Findings	Recommendations
Agri-food	
<p>Agriculture's can play a role as catalyst for employment, especially for youth-led innovative start-ups. EU support can scale-up initiatives for soil conditioning, irrigation solutions, biomass beneficiation. These start-ups create employment for vulnerable communities (youth, women, rural) in agricultural sector.</p> <p>The threat of replacement of smallholder farming by large-scale linear farming practices using monocultures, high levels of mineral fertilisers, pesticides and herbicides is why CE principles should be adopted for small scale farmers, using the opportunity to establish food security by means of circular practices. Senegal has the opportunity to blaze a path for decentralised, small-scale, urban and rural food production using regenerative agricultural practices.</p>	<ul style="list-style-type: none"> • Wide implementation of irrigation and efficient water management could increase crop yield and subsequently create more employment opportunities across the value chain. • Increased crop yield ensures food security for subsistence farmers, where organic waste can also be composted. Pilot schemes in rural areas can be scaled to develop best practice for agriculture in Senegal: to preserve soil quality and organic matter and focus on promoting natural fertilisers and bio-pesticides. • Development and implementation of agro-forestry techniques, where bilateral knowledge sharing can contribute to improved processes on both sides.
<p>There is a lack of knowledge in the agricultural industry to apply best practices, such as the use of organic fertilisers. Senegalese universities are among the best in Africa, hence the challenge is not a lack of expertise but rather the use of the expertise, as many local experts are working in Ministries or institutions in Dakar, instead of supporting producers and industries in the field where knowledge is less available.</p>	<ul style="list-style-type: none"> • The sector needs to be bolstered by a robust capacity building drive that focuses on applying best practices such as the use of organic fertilisers. • Cultivation of plants for fertiliser. This method has already been implemented in a partnership between the new French Aquitaine and Senegal and has shown a considerable increase in the production of the targeted farms.

Findings	Recommendations
	<ul style="list-style-type: none"> Implementing composting initiatives would enrich Senegalese soil, which is still too poor in minerals to meet the country's growing food needs. A collection process for recovery of organic matter from commercial and subsistence agriculture can be initiated and strengthened to supply feedstock to various composting and other initiatives that target the beneficiation of organic wastes. A multitude of organic materials with different origins and characteristics are available as feedstock for fertilisers as well as other applications (depending on production methods). Support for mechanised equipment can increase crop yields and promote more efficient harvesting practices.
Agro-processing	<ul style="list-style-type: none"> Knowledge sharing can also support processing projects to minimise post-harvest food waste. Beneficiation to high-value processed products can add employment opportunities further down value chain. Existing groundnut processing can be revitalised and expanded Processing agricultural products locally can add value to exports while developing a local industry
Chemical industry and plastics	
The existing amount of waste in Senegal is an opportunity for the private recycling sector. More and more people are opting for the creation of recycling companies as well as for the collection of raw materials. The ideology of recycling is already anchored in customs, craftsmen have not waited for the rise of the circular economy to collect and process plastic waste. These small-scale collection and processing businesses need to be scaled up to make a tangible difference to the waste problem in Dakar, particularly.	<ul style="list-style-type: none"> There is opportunity for circular solutions to tackle Senegal's single-use plastic problem that contributes to the ongoing waste crisis. The ban on single use plastics can open up market for renewable and re-usable alternatives. A coherent strategy for alternatives to single-use plastics needs to be developed to accompany the Anti-Plastics law that has recently come into effect. <p>Further the public can be engaged in the minimisation of consumed plastic products.</p>
Construction	
The sector is primed for the adoption of circular economy principles. A holistic approach to the consideration of construction materials as well as waste generated, would add significant value to the sector. Coupling this approach with showcasing cost saving economic efficiencies, will help cement the transition.	The development of eco-construction and the production of bio-sourced materials is conducive to innovation and new trades. The potential for green jobs in the construction sector is significant, however capacity building and skills development is an absolute priority for the successful promotion and implementation of eco-construction.
Waste management, including e-waste	
Many of the collectors are in the informal sector and are exposed to hazardous working conditions. Recognising these actors would make it possible to offer them better conditions while providing them with the health coverage they need in this type of activity.	<ul style="list-style-type: none"> Support for the formalisation of actors on a technical and financial level must be set up. A large campaign should be conducted in the country to explain the advantages of formalisation. This includes access to funding, business support, and capacity building. Neither public nor private actors have the means to collect and raise awareness throughout the territory, which is why a public/private partnership would make it possible to set up widespread collection. This will reduce pollution while creating sustainable jobs across the

Findings	Recommendations
	<p>waste value chain. In order to carry out this collection, the inhabitants of Senegal will have to be trained in good sorting techniques and bins will have to be provided. Provision of infrastructure, such as a space for manual dismantling and picking, before scaling to automated processes such as shredding, sieving, magnetic separation, etc. is needed to support collection and sorting activities.</p> <ul style="list-style-type: none"> • Technical and financial support for acquisition of appropriate technologies for waste disposal and processing. • Support formalisation of the informal sector through the following drivers: <ul style="list-style-type: none"> ○ Scale local innovative solutions used by the informal sector. ○ Adapt European strategies, best practice and lessons learned, taking into account local realities and constraints. <p>Capacity building and upskilling needed prior to planned implementation.</p>
<p>Digital technology is vitally important in developing nations in terms of the creation of employment opportunities and prosperity. Key is capacity building and skills development to support a transition to a digital ecosystem. Digitalisation also enables product traceability, and this implies new and improved logistics services, especially for spare parts for repair, and also for end-of-life products which may find a new use for recycling / remanufacturing.</p> <p>New communities of users or citizens are being created via digital platforms, (re)developing circular economy practices: the sale of second-hand products, car sharing, and other uses related to collaborative economies, functionality, sharing, etc. These platforms may be territorially based, offering exchanges between neighbours or short circuits. The Association Zéro Déchet Sénégal site is a good example. This kind of initiative needs to be extended and supported.</p>	<ul style="list-style-type: none"> • An awareness-raising campaign that supports a digital transition for all would benefit rural communities and demonstrate the reliability and advantage of the new technology. • The country needs to intensify its research and innovation partnerships and facilitate the transfer of environmentally sound and socially inclusive technologies. Emphasis should be placed on the role of the fourth industrial revolution as a major catalyst for green industries and circular economies.
<p>As recycling activities for WEEE and urban mining intensify, the mining industry will face tougher competition from the secondary-resource markets, especially with regard to metals such as aluminium, copper and gold from the growing global e-waste recycling market.</p>	<ul style="list-style-type: none"> • Senegal's mining industry has the potential to work collaboratively with the secondary-resource sector to develop closed loop systems for these metals. Applying sound environmental and social practices in gold extraction, whether from mining or e-waste, together with traceability measures would help position the industry better. <p>Using circular economy principles as a baseline, means that the sector could look beyond upstream activities to localised beneficiation as well.</p>

6 Conclusions

6.1 Circular economy trends in Senegal

Senegal's national development strategy, the Emerging Senegal Plan (PES), provides the political will to drive a circular economy transition. This and other strategic and legal frameworks, and related projects/programmes, show increasing national awareness to support greening of economy, and facilitate commitment to sustainable development. Food security is of concern, exacerbated by climate change, and regenerative agriculture practices that contribute to food security and renewable energy are key for the transition. The sector needs to be bolstered by capacity building with a focus on applying best practices. Waste management in Dakar, and in Senegal as a whole, is fragmented, predominantly informal and complex. Eco-construction is emergent and may offer a path for construction waste beneficiation. There is a strong case for wider application of CEB building.

6.2 Trade and investments in the circular economy in Senegal

A top priority for trade in Senegal is political, technical and financial support for the African Continental Free Trade Agreement. Senegal's trade policy is aimed at building a competitive economy, through inclusive growth and job creation. Its policies are designed to help reduce the trade deficit, ensure regular supplies to the domestic market, promote local value chains, strengthen the regional integration process and access to international markets, and promote competition.

6.3 Existing awareness and capacities on circular economy in Senegal

Beyond policy, there are low national awareness levels, with the majority of businesses and industries not yet actively involved in green, sustainable or circular production activities. An exception is the initiation of industrial programmes that recognise the advantages of a CE transition – predominantly in relation to waste management.

6.4 Existing and future economic, environmental and social impacts and benefits

The implementation of national policies and initiatives that are related to the circular economy have several positive economic, environmental and social impacts and benefits that include:

- Creation of new business and employment opportunities, with employment impact that goes beyond just “creation” but also includes “substitution, elimination, transformation and redefinition”.
- Increased local production: the project “Flowers of hope” run an innovative production system that offers resource-poor women land, inputs and professional training as well as market access to become self-employed agricultural entrepreneurs, supports diversified crops and contribution to food security.

The forward-looking assessment, where a macro-economic model was used to estimate the impact of a (limited) set of circular economy measures in the identified priority sectors agri-food, plastics, construction, EEE products and E-waste and general waste, prognoses that the circular measures could lead to an increase in economic activity and create additional jobs by 2030.

- **Economic benefits:**
 - A 0.6% increase of GDP (+ EUR 311m) compared to business as usual;
 - An improvement of the trade balance, through a reduction in imports worth EUR 100m;
 - Food loss reduction across the agricultural value chain and associated investments are the largest driver of the impacts found in our modelling assessment.
- **Social benefits:**
 - 8,200 additional jobs would be created compared to business as usual, which is equivalent to an increase of 0.15%;
 - If done in the right way, increased activities in waste collection and recycling could strengthen the economic position of (informal) waste workers, and attention for capacity building and training can ensure that these people will benefit from the CE transition as well.
 - The largest employment increases are found to occur in agriculture, education and health, construction and financial intermediation and business activities. The largest job loss occurs in the chemicals and metal sector, due to product substitutions.

Overall, these findings show that even implementing a first set of circular measures could bring substantial benefits to Senegal's economy. This illustrates that circular economy could be one of the cornerstones of Senegal's economic diversification and green growth strategies.

6.5 Mapping of CE-related cooperation activities between the EU and Senegal

The Circular economy is politically prominent in Senegal. However, there is a need for clarity on roles and responsibilities, amongst ministerial mandates. Even though strategy for circular economy is key nationally, the local situation remains extremely complex. For a transition to a circular economy, policy and cooperation across borders is a key driver. The EU and Senegal have adopted a joint statement outlining possible areas for cooperation, formalised as the "Dakar Pathways to Advance Circular Economy, Green Industries and Jobs in West Africa".

6.6 Sector-specific conclusions

6.6.1 Agri-food

Senegal's agriculture sector cannot meet the country's growing food needs, due to poor soils and availability of arable land. Implementation of irrigation and efficient water management could not only increase crop yield but create more employment opportunities across the value chain. Capacity building is needed that includes focus on applying best practice, to ensure broad implementation of new agricultural techniques.

6.6.2 The chemical industry, including plastics and construction

The pervasive single-use plastics problem and the dire waste management situation in Dakar (and other urban hubs) draws focus to the plastics industry. In the absence of a coordinated and strategic approach at national or international level, there is the risk that companies will adopt approaches that are not suited to the local context or are too focused on short-term offensive action that precludes more sustainable or higher-value material use. An enabling environment through the use of special economic zones or industrial parks would ensure longevity and meaningful impact.

Eco-construction and production of bio-sourced materials in construction industry has potential to be a creator of green jobs, conducive to circular innovation and new trades. This sector is primed for adoption

of circular economy principles. However, a holistic approach to selection of construction materials as well as waste generated, is needed. Coupling this with cost saving resource efficiencies, will help cement the transition to a circular economy.

6.6.3 E- Waste management

As recycling activities for WEEE and urban mining intensify, the mining industry will face competition from the secondary-resource markets. A strong management approach and regulatory framework for the e-waste sector is necessary. The mining industry has the potential to work collaboratively with the secondary-resource sector to develop closed loop systems for metals. Using circular economy principles as a baseline, means that the sector could look beyond upstream activities to localised beneficiation as well.

References

Afd.fr. 2020. Afric'innov Project: Supporting The Development Of Innovative Entrepreneurship In Africa. [online] Available at: <<https://www.afd.fr/en/carte-des-projets/africinnov-project-supporting-development-innovative-entrepreneurship-africa?origin=/en/carte-des-projets>> [Accessed 26 June 2020].

Africatimes.com. (2019). Africa must follow Senegal's lead and ensure rural communities are not forgotten | Africa Times. [online] Available at: <https://africatimes.com/2019/09/30/africa-must-follow-senegals-lead-and-ensure-rural-communities-are-not-forgotten/> [Accessed 14 May 2020].

Afrik 21. 2020. SENEGAL: Three Development Partners Finance Clean-Up Of Hann Bay | Afrik 21. [online] Available at: <<https://www.afrik21.africa/en/senegal-three-development-partners-finance-clean-up-of-hann-bay/>> [Accessed 26 June 2020].

Afrik21 (2020). Senegal: AFD completes existing loan for Dakar drinking water project. [online] Available at: <https://www.afrik21.africa/en/senegal-afd-completes-existing-loan-for-dakar-drinking-water-project/>

Agence française de Développement (2019). Depollution de la baie de Hann. [online] Available at: <https://www.afd.fr/fr/carte-des-projets/depollution-de-la-baie-de-hann>

Agence française de Développement (2019). Appuyer une gestion intégrée des Inondations au Sénégal. [online] Available at: <https://www.afd.fr/fr/carte-des-projets/appuyer-une-gestion-integree-des-inondations-au-senegal>

Agence française de Développement (2018). Accompagner le Sénégal dans la mise en Oeuvre de sa Politique de l'eau et de l'assainissement. [online] Available at: <https://www.afd.fr/fr/carte-des-projets/accompagner-le-senegal-dans-la-mise-en-oeuvre-de-sa-politique-de-leau-et-de-l-assainissement>

Agence française de Développement (2016). Renforcer l'accès à l'eau potable dans la région de Dakar. [online] Available at: <https://www.afd.fr/fr/carte-des-projets/renforcer-lacces-leau-potable-dans-la-region-de-dakar>

Agence française de Développement (2016). Senegal. [online] Available at: <https://www.afd.fr/fr/page-region-pays/senegal>

Agence Nationale de la Statistique et de la Démographie (2011). Enquête Nationale Sur Le Secteur Informel Au Sénégal. [online] Available at: <http://anads.ansd.sn/index.php/citations/13>

ALIMENTERRE. 2020. Le Sénégal Peut Nourrir Le Sénégal. [online] Available at: <<https://www.alimenterre.org/le-senegal-peut-nourrir-le-senegal>> [Accessed 25 June 2020].

Arterial Network (2015). Dakar, Senegal, A Youth-led outlook for the urban fabric. [online] Available at: <https://en.unesco.org/creativity/story/dakar-senegal-1>

Assistance Technique Pour La Gestion Durable Des Déchets D'Équipements Électriques Et Électroniques (D3E) (n.p) Au Sénégal. Global Green Growth Institute. Document not available online- provided by GGGI.

Association Zero Dechet Senegal (2020). "Plastic Law" Perceptions And Expectations In Dakar. [ebook] Available at: <<https://zerowastesenegal.org/wp-content/uploads/2020/04/LOOKA-Plastic-Law-Study-Association-Zero-Waste-SN-Avril-2020-EN.pdf>> [Accessed 26 June 2020].

Atkisson.com. 2020. Sustainability Accelerator Network “ Proplast Brings Plastic Recycling And Livelihood To Communities In Senegal. [online] Available at: <<http://atkisson.com/proplast-plastic-recycling-senegal/>> [Accessed 26 June 2020].

Aventurin (2020). Establishing a value chain for plastic waste. Available at: <https://www.aventurin.one/waste>

Balde, C. P. (2017). The Global E-Waste Monitor. [ebook] Available at: <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=13&cad=rja&uact=8&ved=2ahUK Ewi7gujn5qHpAhVrxYUKHQLKAPsQFjAMegQIBBAB&url=https%3A%2F%2Fwww.iswa.org%2Findex.php%3FelD%3Dtx_iswaknowledgebase_download%26documentUid%3D5070&usg=AOvVaw2MyWFnZuD9GCtIBJ5KFmPD> [Accessed 26 June 2020].

Bank, A.D. (2019). Senegal Economic Outlook. [online] African Development Bank - Building today, a better Africa tomorrow. Available at: <https://www.afdb.org/en/countries/west-africa/senegal/senegal-economic-outlook> [Accessed 11 May 2020].

Bonergie.com. 2020. Home - Bonergie. [online] Available at: <<https://www.bonergie.com/en/>> [Accessed 6 July 2020].

BTC (2011). FAIR AND SUSTAINABLE TRADE IN Senegal. [ebook] Available at: <https://www.befair.be/drupal_files/public/all-files/brochure/CE-SENEGAL_EN_Web.pdf> [Accessed 26 June 2020].

Chatham House. 2019. An Inclusive Circular Economy. [ebook] Available at: <<https://www.chathamhouse.org/sites/default/files/publications/research/2019-05-22-Circular%20Economy.pdf>> [Accessed 26 June 2020].

Chinafrica.cn (2020). Zoning In On Investment-- Chinafrica. [online] Available at: <http://www.chinafrica.cn/Homepage/201802/t20180209_800117425.html> [Accessed 25 June 2020].

Climate and Clean Air Coalition Municipal Solid Waste Initiative (2018). Solid Waste Management City Profile. 2018. Solid Waste Management City Profile. [ebook] Climate and Clean Air Coalition Municipal Solid Waste Initiative. Available at: <https://www.waste.ccacoalition.org/sites/default/files/files/dakar_city_profile_v2.pdf> [Accessed 26 June 2020].

Commission Nationale du Developpement Durable (2009). NATIONAL REPORT ON SUSTAINABLE DEVELOPMENT: SENEGAL'S CONTRIBUTION TO THE 18TH AND 19TH SESSIONS OF THE UNITED NATIONS COMMISSION ON SUSTAINABLE DEVELOPMENT

Conference regionale de haut niveau Economie circulaire, emplois, industries vertes Dakar les 22 et 23 juillet 2019

construction21.org (2020). Construction With Raw Soil In Senegal - Construction21.

CORDIS - European Commission (2018). Support to the implementation of the Long-term EU-AU Research and Innovation Partnership for Food and Nutrition Security and Sustainable Agriculture. [online] Available at: <https://cordis.europa.eu/project/id/817663>

CORDIS - European Commission (2018). Preparing for a Long-Term Joint EU-AU Research and Innovation Partnership on Renewable Energy. [online] Available at: <https://cordis.europa.eu/project/id/815264/de>

CORDIS - European Commission. Coordination and Advancement of Sub-Saharan Africa-EU Science & Technology Cooperation Network. [online] Available at: <https://cordis.europa.eu/project/id/212625/de>

CORDIS - European Commission. African monsoon multidisciplinary analysis. [online] Available at: <https://cordis.europa.eu/project/id/004089/de>

CORDIS - European Commission. INTEGRATED WASTE MANAGEMENT IN WESTERN AFRICA. [online] Available at: <https://cordis.europa.eu/project/id/244188/de>

CORDIS - European Commission. BioTechnology for Africa's sustainable water supply. [online] Available at: <https://cordis.europa.eu/project/id/265972>

CORDIS - European Commission. Network for the development of sustainable approaches for large-scale implementation of sanitation in Africa [online] Available at: <https://cordis.europa.eu/project/id/37099>

CORDIS - European Commission (2003). European Commission (2003) Policy research to identify conditions for optimal functioning of the Senegal river ecosystem in mali, mauritania and senegal. Available at: <https://cordis.europa.eu/project/id/ICA4-CT-2000-30024>

Cordis.europa.eu. 2020. CORDIS | European Commission. [online] Available at: <<https://cordis.europa.eu/project/id/ICA4-CT-2000-30024>>

Côte, A. (2020). Loi N°2020-04: Note De Positionnement De L'Association Zéro Déchet Sénégal - Zerowastesenegal.Org. [online] Zerowastesenegal.org

Countryeconomy.com (n.d.). Sovereigns Ratings List. Available at: <https://countryeconomy.com/ratings>.

Countryreports.org (2020). Senegal Geography. Available at <https://www.countryreports.org/country/Senegal/geography.htm>

DAKARACTU.COM (2020). Gestion Durable Des Déchets Solides Urbains (PGDSU) : Une Nouvelle Generation D'infrastructures Pour Impulser La Valorisation Des Déchets. [online] DAKARACTU.COM. Available at: <https://www.dakaractu.com/Gestion-durable-des-dechets-solides-urbains-PGDSU-une-nouvelle-generation-d-infrastructures-pour-impulser-la_a87027.html> [Accessed 26 June 2020].

Deloitte (2020) How Senegal remained attractive after the COVID-19 pandemic. Available at: <https://www2.deloitte.com/lu/en/pages/tax/articles/senegal-remained-attractive-after-covid-19-pandemic.html>.

DHL (2019). A vote of confidence: Senegal on for economic success. [online] Available at: <https://lot.dhl.com/a-vote-of-confidence-senegal-on-track-for-economic-success/>

DIGITAL SOLIDARITY PROGRAM 2011-2015. [ebook] Available at: <<http://www.servicepublic.gouv.sn/assets/textes/Programme-solidarite-numerique.pdf>>

Diversity of Cultural Expressions. 2020. Dakar, Senegal. [online] Available at: <<https://en.unesco.org/creativity/story/dakar-senegal-1>> [Accessed 25 June 2020].

Docs.wfp.org. 2018. *Rapid Analysis Of Food Security In Northern Senegal*. [online] Available at: <<https://docs.wfp.org/api/documents/WFP-0000069792/download/>> [Accessed 26 June 2020].

DRAFT: Projet de décret n°. Relatif à la gestion des déchets d'équipements électriques et électroniques (DEEE).

EEAS (2020). *Projets De Moins D'un Million D'euros (2015-2016)*. [ebook] Available at: <https://eeas.europa.eu/sites/eeas/files/liste_projets_de_moins_1_millions_finances_ue_senegal_fr.pdf> [Accessed 31 August 2020].

Editor, A. (2020). Interview With Ms. Soham El Wardini, Mayor Of Dakar - [africa.Com](https://africa.com). EIB (2007). Senegal Water Programme.

EIB (2008). Dakar Sanitation. Available at: <https://www.eib.org/en/projects/pipelines/all/20070401>.

EIB (2008). Dakar Sanitation. Available at: <https://www.eib.org/en/projects/pipelines/all/20070401>.

EIB (2014). Senegal river valley rice. [online] Available at: <https://www.eib.org/en/projects/pipelines/all/20140560>

EIB (2016). KMS 2 - Approvisionnement en Eau de Dakar. [online] Available at: <https://www.eib.org/de/projects/pipelines/all/20140043>

EIB (2017). Senegal Water Programme. Available at: <https://www.eib.org/en/press/all/2016-229-sustainable-development-in-west-africa-eib-supports-water-supply-in-senegal-100-meur>.

EIFFAGE (n.d.) Circular Economy. [online] Available at: <https://www.eiffage.com/en/home/developpement-durable/economie-circulaire.html>

Ellenmacarthurfoundation.org (2020). [online] Available at: https://www.ellenmacarthurfoundation.org/assets/downloads/Mobility_All_Mar19.pdf [Accessed 20 August 2020].

Esdaile, L., J. and Chalker, J. (2018). The Mercury Problem In Artisanal And Small Scale Gold Mining. [ebook] Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5969110/> [Accessed 25 June 2020].

EU Emergency Trust Fund for Africa - European Commission (2020). The Enterprise Upgrading Office Of Senegal Supports Job Creation In The Regions Of Departure. [online] Available at: https://ec.europa.eu/trustfundforafrica/all-news-and-stories/le-bureau-de-mise-niveau-des-entreprises-du-senegal-accompagne-la-creation_en#:~:text=10%2520January%25202019-,Le%2520Bureau%2520de%2520Mise%2520%25C3%25A0%2520Niveau%2520des%2520entreprises%2520du%2520S%25C3%25A9gal,aider%2520%25C3%25A0%2520transformer%2520leurs%2520entreprises.> [Accessed 7 July 2020].

EU Science & Innovation - European Commission (2020). Horizon 2020 In Senegal. [online] Available at: https://ec.europa.eu/knowledge4policy/online-resource/horizon-2020-senegal_en [Accessed 7 July 2020].

Eur-lex.europa.eu (2020). EUR-Lex - R12101 - EN - EUR-Lex. Eur-lex.europa.eu. 2020. EUR-Lex - R12101 - EN - EUR-Lex. [online] Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM:r12101> [Accessed 26 June 2020].

Euractiv.com (2020). France Steps Up Efforts For Education Aid. [online] Available at: <https://www.euractiv.com/section/africa/news/france-steps-up-efforts-for-education-aid/> [Accessed 26 June 2020].

European Commission (2019). Dakar Pathways To Advance Circular Economy, Green Industries And Jobs In West Africa. [online]. Available at: https://ec.europa.eu/info/news/dakar-pathways-advance-circular-economy-green-industries-and-jobs-west-africa-2019-jul-24_en [Accessed 26 June 2020].

European Commission (2020). Press Corner. [online] Available at: https://ec.europa.eu/commission/presscorner/detail/en/IP_19_5980 [Accessed 26 June 2020].

European Commission. *OF ECONOMIC PARTNERSHIP AGREEMENTS*. [ebook] Available at: https://trade.ec.europa.eu/doclib/docs/2009/september/tradoc_144912.pdf [Accessed 31 August 2020].

European Commission (2020) International platform on sustainable finance. [online] available at: https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/international-platform-sustainable-finance_en.

European External Action Service - European Commission (2020). Senegal And The EU. [online] Available at: https://eeas.europa.eu/delegations/senegal/11756/senegal-and-eu_en [Accessed 26 June 2020].

European Union External Action (2016). Projects Under \$1 Million (2015-2016). [ebook] Available at: https://eeas.europa.eu/sites/eeas/files/liste_projets_de_moins_1_millions_finances_ue_senegal_fr.pdf [Accessed 26 June 2020].

Eurostat - International trade in goods by partner. [online] Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php/International_trade_in_goods_by_partner

Faye, A. (2017). FIRST PROMOTION OF MASTER II "TRANSPORT AND SUSTAINABLE MOBILITY IN AFRICAN CITIES". [ebook] Available at: <<http://www.codatu.org/wp-content/uploads/M%C3%A9moire-Amady-Baro-FAYE.pdf>> [Accessed 26 June 2020].

Fischerei - European Commission (2020). EU Concludes Sustainable Fishing Partnership Agreement Protocol With Senegal - Fischerei - European Commission. [online] Available at: <https://ec.europa.eu/fisheries/press/eu-concludes-sustainable-fishing-partnership-agreement-protocol-senegal_de?2nd-language=hr> [Accessed 26 June 2020].

Fitchsolutions.com (2020). Senegalese Growth To Slow Sharply In 2020. [online] Available at: <<https://www.fitchsolutions.com/country-risk-sovereigns/economics/senegalese-growth-slow-sharply-2020-02-04-2020>> [Accessed 25 June 2020].

futurepolicy.org. 2020. *Senegal'S National Strategy Promotion Of Green Jobs - Futurepolicy.Org*. [online] Available at: <<https://www.futurepolicy.org/global/senegals-national-strategy-for-the-promotion-of-green-jobs-snev-strategy/>> [Accessed 31 August 2020].

Geissler, Bernhard & Hermann, Ludwig & Mew, Michael & Steiner, Gerald (2018). Striving Toward a Circular Economy for Phosphorus: The Role of Phosphate Rock Mining. Geissler, Bernhard & Hermann, Ludwig & Mew, Michael & Steiner, Gerald. (2018). Striving Toward a Circular Economy for Phosphorus: The Role of Phosphate Rock Mining. Minerals. 8. 10.3390/min8090395.

GFDRR.org (n.d.). Dakar: Minimizing Waste Challenges, Maximizing Urban Resilience. SOI Dakar: Minimizing Waste Challenges, Maximizing Urban Resilience Gfdr.org. 2017. [online] Available at: <https://www.gfdr.org/sites/default/files/CRP/SOI_Dakar.pdf> [Accessed 7 July 2020].

Gfdr.org (2020). City Resilience Program | GFDRR. [online] Available at: <<https://www.gfdr.org/en/crp>> [Accessed 20 August 2020].

Globalpartnership.org (2020). Senegal | Global Partnership For Education. Globalpartnership.org. 2020. Senegal | Global Partnership For Education. [online] Available at: <<https://www.globalpartnership.org/where-we-work/senegal>> [Accessed 26 June 2020].

Globalwaters.org (2020). Dakar International Water Association. [online] Available at: <<https://www.globalwaters.org/resources/assets/wash-fin/senegal-factsheet>> [Accessed 26 June 2020].

Gouvernement Republique du Senegal (2020). Code de l'environnement. [online] Available at: <<https://www.sec.gouv.sn/code-de-l%E2%80%99environnement>> [Accessed 7 July 2020].

Green Economy Coalition (2018). The Green Economy Barometer 2018 Senegal. [ebook] Available at: <<https://www.greeneconomycoalition.org/assets/reports/Barometers-2018/Senegal-GE-Barometer-2018-Final-WEB.pdf>> [Accessed 26 June 2020].

GTAI Germany Trade & Investment (2020). Basiswissen Einfuhr in Senegal. [online] Available at: <<https://www.gtai.de/gtai-de/trade/zoll/zoll-und-einfuhr-kompakt/senegal/basiswissen-einfuhr-in-senegal-57574>> [Accessed 26 June 2020].

Hoornweg, Daniel; Bhada-Tata, Perinaz (2012). What a Waste: A Global Review of Solid Waste Management. Hoornweg, Daniel; Bhada-Tata, Perinaz. 2012. What a Waste: A Global Review of Solid Waste Management. Urban development series;knowledge papers no. 15. World Bank, Washington, DC. © World Bank.

IEA (2019) Tracking industry report - cement. Available at: <https://www.iea.org/reports/cement>

IGLU (2020). Le Systeme De Transport Urbain Dans La Region De Dakar - Senegal : Contraintes Et Perspectives | IGLUS. IGLUS. 2020. Le Systeme De Transport Urbain Dans La Region De Dakar - Senegal : Contraintes Et Perspectives | IGLUS. [online] Available at: <<https://iglus.org/le-systeme-de-transport-urbain-dans-la-region-de-dakar-senegal-contraintes-et-perspectives/>> [Accessed 26 June 2020].

Ilo.org (2020). Start And Improve Your Business Programme (ENTERPRISES). Ilo.org. 2020. Start And Improve Your Business Programme (ENTERPRISES). [online] Available at: <<https://www.ilo.org/empent/areas/start-and-improve-your-business/lang--en/index.htm>> [Accessed 26 June 2020]

Indorama.com (2020). INDUSTRIES CHIMIQUES DU SENEGAL. Indorama.com. 2020. INDUSTRIES CHIMIQUES DU SENEGAL. [online] Available at: <<http://www.indorama.com/affiliated-companies/industries-chimiques%20du-senegal>> [Accessed 25 June 2020].

International Trade Centre (2014). ITC by Country Report Senegal. [online] Available at: <https://www.intracen.org/layouts/downloadcountryreport.aspx?id=696>

International Trade Centre (2014). Senegal. [online] Available at: <https://www.intracen.org/country/senegal/Domestic-and-Foreign-Market-Access/>

Intracen.org (2020). Senegal. Intracen.org. 2020. Senegal. [online] Available at: <<http://www.intracen.org/country/senegal/Domestic-and-Foreign-Market-Access/>> [Accessed 26 June 2020].

ITIE (2017). Rapport ITIE. [ebook] Available at: <<http://itie.sn/wp-content/uploads/2018/11/Rapport-ITIE-2017-S%2525C3%2525A9n%2525C3%2525A9gal-vf.pdf>> [Accessed 25 June 2020].

ITIE Senegal (2017). Initiative pour la Transparence dans les Industries Extractives du Senegal. [ebook] Available at: <<http://itie.sn/wp-content/uploads/2018/11/Rapport-ITIE-2017-S%C3%A9n%C3%A9gal-vf.pdf>> [Accessed 25 June 2020].

Jambeck, J. R., et al. (2011). Plastic Waste Inputs From Land Into the Ocean. [ebook] iswa. Available at: <https://www.iswa.org/fileadmin/user_upload/Calendar_2011_03_AMERICANA/Science-2015-Jambeck-768-71__2_.pdf> [Accessed 25 June 2020].

JeuneAfrique.com. (2020). Dakar Et Nouakchott S'Entendent Sur L'Achat-Vente Du Gaz Issu Du Projet Grand Tortue-Ahmeyim - Jeune Afrique. JeuneAfrique.com. 2020. Dakar Et Nouakchott S'Entendent Sur L'Achat-Vente Du Gaz Issu Du Projet Grand Tortue-Ahmeyim - Jeune Afrique. [online] Available at: <<https://www.jeuneafrique.com/895148/economie/dakar-et-nouakchott-sentendent-sur-lachat-vente-du-gaz-issu-du-projet-grand-tortue-ahmeyim/>> [Accessed 25 June 2020].

KfW (2016). Ex post evaluation - Senegal. [online] Available at: <https://www.kfw-entwicklungsbank.de/International-financing/KfW-Development-Bank/Our-results/Results/Ex-Post-Evaluation-Reports-R-S/>

KfW (2011). Ex post-Evaluation Brief, Senegal: Water Supply in Regional Towns. [online] Available at: https://www.kfw-entwicklungsbank.de/migration/Entwicklungsbank-Startseite/Development-Finance/Evaluation/Results-and-Publications/PDF-Dokumente-R-Z/Senegal_Wasserversorgung_Regionalst%C3%A4dte_2011.pdf

KfW (2007). Senegal: Water Supply in Six River Cities. [online] Available at: https://www.kfw-entwicklungsbank.de/migration/Entwicklungsbank-Startseite/Development-Finance/Evaluation/Results-and-Publications/PDF-Dokumente-R-Z/Senegal_Water_Supply_2007.pdf

KfW (n.d.). Senegal. [online] Available at: <https://www.kfw-entwicklungsbank.de/Internationale-Finanzierung/KfW-Entwicklungsbank/Weltweite-Pr%C3%A4senz/Subsahara-Afrika/Senegal/>

Kimbi Yaah, V. B. (2018). Improvement of the Waste Management System in Senegal.

LEAP-Agri (2020). *WAGRINNOVA*. [online] Available at: <https://www.leap-agri.com/?page_id=277> [Accessed 1 September 2020].

Lepetitjournal.com (2020). Ciprovis : La Start-Up Dakaroise Qui Recycle Les Déchets. [online] Available at: <<https://lepetitjournal.com/dakar/ciprovis-la-start-dakaroise-qui-recycle-les-dechets-253242>> [Accessed 7 July 2020].

Lloyds Bank (2020). Foreign direct investment (FDI) in Senegal. [online] Available at: <https://www.lloydsbanktrade.com/en/market-potential/senegal/investment>

Lux-Development (2020). Republic of Senegal. [online] Available at: <https://luxdev.lu/en/activities/country/SEN>

Mafrwestafrica.net (2020). Gestion Des Déchets. Mafrwestafrica.net. 2020. Gestion Des Déchets. [online] Available at: <<https://www.mafrwestafrica.net/justice-et-paix/3709-gestion-des-dechets>> [Accessed 26 June 2020].

Makesense Afrique (2020). Formations - Makesense Afrique. makesense Afrique. 2020. Formations - Makesense Afrique. [online] Available at: <<https://africa.makesense.org/competences-21-siecle-formations/>> [Accessed 6 July 2020].

Marques(2020). Sénégal. [online] Coca-colaafrique.com. Available at: <<https://www.coca-colaafrique.com/topics/senegal>>

Mballo, D. (2015). *Geolhyan se met au Coeur du developpement durable*.

McClintock, N. (2020). *Women In Senegalese Periurban Agriculture: The Case Of Touba Peycouck*. [ebook] Available at: <http://web.pdx.edu/~ncm3/files/McClintock_RUAF.pdf> [Accessed 18 August 2020]

McCormick, E., et al. (2020). *Where Does Your Plastic Go? Global Investigation Reveals America's Dirty Secret*. McCormick, E., Fullerton, J., Gee, A., Simmonds, C., Murray, B., Fonbuena, C., Kijewski, L. and Saraçoğlu, G., 2020. *Where Does Your Plastic Go? Global Investigation Reveals America's Dirty Secret*. [online] the Guardian. Available at: <<https://www.theguardian.com/us-news/2019/jun/17/recycled-plastic-america-global-crisis>> [Accessed 6 July 2020].

Ministre de l'Environnement et du Developpement Durable (2020). *PROJECT FOR THE PROMOTION OF INTEGRATED MANAGEMENT AND ECONOMICS OF SOLID WASTE IN SENEGAL(PROMOGED)*. [ebook] Available at: <<http://www.ucg.gouv.sn/wp-content/uploads/2019/05/Rapport-Final-CPR-PROMOGED-.pdf>> [Accessed 6 July 2020].

Ministre de l'Europe et des Affaires Etrangères. Senegal. [online] Available at: <https://www.diplomatie.gouv.fr/fr/conseils-aux-voyageurs/conseils-par-pays-destination/senegal/>

Ministre de la Gouvernance locale, du Developpement et de l'Amenagement du Terroire (2016). *Report Of The National Campaign For The Characterization Of Household And Similar Wastes*. [ebook] Available at: <http://www.ucg.gouv.sn/wp-content/uploads/2018/08/Rapport_national.pdf> [Accessed 26 June 2020].

N.a. (2009). *Liberalization Of Climate-Friendly Environmental Goods: Issues For Small Developing Countries*. [ebook] Available at: <<https://pdfs.semanticscholar.org/bc84/943ac0d812961e95a80014d8b86163377934.pdf>> [Accessed 7 July 2020].

New climate economy (2018). *REALIZING THE HISTORY OF INCLUSIVE GROWTH IN THE 21st CENTURY: ACCELERATING CLIMATE ACTION IN A TIME OF EMERGENCY*. [online] Available at: <https://newclimateeconomy.report/2018/wp-content/uploads/sites/6/2018/11/NCE_2018_Resume_Fran%C3%A7ais.pdf> [Accessed 25 June 2020]

Oxfarm (2005). The Impact Of The Second-Hand Clothing Trade On Developing Countries. [ebook] Available at: <<https://oxfamilibrary.openrepository.com/bitstream/handle/10546/112464/rr-impact-second-hand-clothing-trade-developing-countries-010905-en.pdf?sequence=1&isAllowed=y>> [Accessed 26 June 2020].

PAGE 2030 Strategy and Development Plan 2021-2025. Provided by email, not published.

Plastic1.com (2020). Plastic Suppliers In Senegal. [online] Available at: <<https://www.plastic1.com/plastic-suppliers/senegal>> [Accessed 26 June 2020].

Policy Center for the New South (2020). Fertilizer Use In Africa: A Price Issue. [online] Available at: <<https://www.policycenter.ma/publications/fertilizer-use-africa-price-issue>> [Accessed 18 August 2020].

PopulationData.net (2019). Senegal. Available at: <https://www.populationdata.net/pays/senegal/>

Presidence.sn (2020). Emerging Senegal, Economic & Social Policy Of The Republic Of Senegal. [online] Available at: <<http://www.presidence.sn/en/pse/emerging-senegal>> [Accessed 26 June 2020].

Proplast-industrie.sn (2020). Services & Solutions Proplast Industrie. [online] Available at: <<https://proplast-industrie.sn/services/#Collectivit2>> [Accessed 26 June 2020].

PS-EAU (2002). The Recycling Sector In Senegal For The Metal And Plastic Sectors. 2002. The Recycling Sector In Senegal For The Metal And Plastic Sectors. [ebook] Available at: <https://www.pseau.org/epa/gdda/Actions/Action_D06/Rapport_Senegal_D06.pdf> [Accessed 26 June 2020].

PV Cycle (2016).

Reuters.com (2020). Senegal To Crack Down On Huge Plastic Waste By Enforcing Law. [online] Available at: <<https://www.reuters.com/article/us-environment-senegal-plastic/senegal-to-crack-down-on-huge-plastic-waste-by-enforcing-law-idUSKCN1U010H>> [Accessed 26 June 2020].

Rogers Capital (2020). Senegal & Mauritius | Building A Two-Way Street | Rogers Capital. [online] Available at: <<https://www.rogerscapital.mu/senegal-and-mauritius-building-a-two-way-street>> [Accessed 25 June 2020].

SAUR (2020). SAUR worldwide. [online] Available at: <https://www.saur.com/en/the-group/international/saur-worldwide/>

SEED (2020). Flower Of Hope. [online] Promoting Entrepreneurship for Sustainable Development. Available at: <<https://seed.uno/enterprise-profiles/flower-of-h-o-p-e>> [Accessed 6 July 2020].

SEED (n.d.) Reusing Waste Charcoal As Biochar. [online] SEED - Promoting Entrepreneurship for Sustainable Development. Available at: <<https://www.seed.uno/enterprise-profiles/reusing-waste-charcoal-as-biochar>> [Accessed 26 June 2020].

Settic.sn (2020). Settic Acceuil. [online] Available at: <<https://www.settic.sn/>>

Senrecycle.business.site (2020). Senrecycle. [online] Available at: <<https://senrecycle.business.site/>> [Accessed 7 July 2020].

Sidy, T. Zelem, M. (2018). Environmental And Economic Recovery Of Organic "Waste" In Peri-Urban Market Gardening In Dakar, Senegal.[ebook] Available at: <<https://hal.archives-ouvertes.fr/hal-01757784/document>> [Accessed 25 June 2020].

Simpa.sn (2020). Nos Produits | SIMPA. [online] Available at: <<http://www.simpa.sn/fr/nos-produits>> [Accessed 6 July 2020].

Site Institutionnel du Groupe Sonatel (2020). Environment: Sonatel And Proplast Industrie Sign A Partnership To Set Up Kiosks For The Recovery Of Plastic Waste.. [online] Available at: <<https://sonatel.sn/environnement-sonatel-proplast-industrie-signent-partenariat-deployer-kiosques-de-recuperation-dechets-plastiques/>>

Societe Generale (2020). Country risk of Senegal: International Trade. [online] Available at: <https://import-export.societegenerale.fr/en/country/senegal/trade-country-risk>

Solid Waste Management And Risks To Health In Urban Africa. 2020. [ebook] Available at: <<https://www.urbanark.org/sites/default/files/resources/Urban-ARK-Dakar-Report.pdf>> [Accessed 26 June 2020].

Steiner, G. Unlock Hidden Innovation Potentials: Uncertainty, Risk, & Opportunity Costs. In Proceedings of the IFA: Production and International Trade Conference, Paris, France, 22-24 February 2017.

Surfrider Foundation (2020). Home. [online] Available at: <<https://www.surfrider.org>> [Accessed 26 June 2020].

Sustainability Times (2019). Senegal: Africa's new waste warrior?. [online] Available at: <<https://www.sustainability-times.com/environmental-protection/senegal-africas-new-waste-warrior/>> [Accessed 25 June 2020].

SWI swissinfo.ch. (2020). The Shady Origins Of Gold Refined In Switzerland. [online] Available at: <https://www.swissinfo.ch/eng/multinationals_the-shady-origins-of-gold-refined-in-switzerland/44621040> [Accessed 25 June 2020].

The Africa Report.com (2020). Senegal'S Maiden Offshore Oil Production Pushed To 2023. [online] Available at: <<https://www.theafricareport.com/20442/senegals-maiden-offshore-oil-production-pushed-to-2023/>> [Accessed 25 June 2020].

The World Bank (2020). The World Bank in Senegal. [online] Available at: <https://www.worldbank.org/en/country/senegal>

Trading Economics (2019). Ease of doing Business in Senegal. [online] Available at: <https://tradingeconomics.com/senegal/ease-of-doing-business>

Tradingeconomics.com (2020). Senegal Industrial Production Mom | 2008-2020 Data | 2021-2022 Forecast | Historical. [online] Available at: <<https://tradingeconomics.com/senegal/industrial-production-mom>> [Accessed 25 June 2020].

Transparency International (2019). Corruption Perception Index. [online] Available at: <https://www.transparency.org/en/cpi/2019#>

Trendeconomy.com (2020). Senegal | Imports And Exports | World | Mineral Or Chemical Fertilisers, Nitrogenous | Netweight (Kg); Quantity And Value (US\$) | 2008 - 2019. [online] Available at: <<https://trendeconomy.com/data/h2/Senegal/3102>> [Accessed 25 June 2020].

Ulule (2020). Kao-Plast, Social Business In Plastic Recycling. [online] Available at: <<https://de.ulule.com/kao-plast-entreprise-sociale-et-solidaire-de-recyc/>> [Accessed 26 June 2020].

UN Environment (2018). The State Of Knowledge Of Crimes That Have Serious Impacts On The Environment. [ebook] Available at: <https://wedocs.unep.org/bitstream/handle/20.500.11822/25713/knowledge_crime_envImpacts.pdf?sequence=1&isAllowed=y> [Accessed 26 June 2020].

Un-page.org (2020). Start And Improve Your Business - Green Entrepreneurship Training In Senegal | PAGE. [online] Available at: <<https://www.un-page.org/start-and-improve-your-business-green-entrepreneurship-training-senegal>> [Accessed 26 June 2020].

Un-page.org (2020). *Senegal And Burkina Faso Provide Training Of Trainers Workshop To Support Green Enterprise Creation And Green Business* | PAGE. [online] Available at: <<https://www.un-page.org/senegal-and-burkina-faso-provide-training-trainers-workshop-support-green-enterprise-creation-and>> [Accessed 31 August 2020].

UNEP (2014). Green Economy Assessment Study - Senegal. [online] Available at: <https://www.un-page.org/files/public/content-page/green_economy_assessment_study_senegal_unep.pdf>

UNO Environment (2019). PLAN D’ACTION NATIONAL visant a reduire et eliminer l’usage du mercure dans l’extraction miniere artisanale et a petite echelle d’or au Senegal. [online] Available at: <http://www.mercuryconvention.org/Portals/11/documents/NAP/Senegal_ASGM_NAP-Nov2019-FR.pdf>

US Geological Survey (2015). The Mineral Industries of The Gambia, Guinea-Bissau, and Senegal in 2012. [online] Available at: <https://s3-us-west-2.amazonaws.com/prd-wret/assets/palladium/production/mineral-pubs/country/2012/myb3-2012-ga-pu-sg.pdf>

Veolia (2017). Veolia to design and build water treatment plat in Dakar, Senegal. Press release: Africa - Municipal Water. Paris - Dakar. [online] Available at: <https://www.veolia.com/en/veolia-group/media/press-releases/veolia-design-and-build-water-treatment-plant-dakar-senegal>

Voice of America (2020). Surfer Launches Dakar’s First Zero-Waste Restaurant. [online] Available at: <<https://www.voanews.com/africa/surfer-launches-dakars-first-zero-waste-restaurant>> [Accessed 26 June 2020].

Wabef.cirad.fr (2020). *Partnership - WABEF Project*. [online] Available at: <<https://wabef.cirad.fr/en/partnership>> [Accessed 1 September 2020].

WATHI (2020). Interview With Pod Estelle Ndour. WATHI. 2020. Interview With Pod Estelle Ndour. [online] Available at: <<https://www.wathi.org/debat-id/contributions-changement-climatique/il-faut-promouvoir-la-valorisation-des-dechets-car-il-y-a-des-opportunites-demploi-pour-les-jeunes-dans-cette-filiere-entretien-avec-pod-estelle-ndour/>> [Accessed 26 June 2020].

Workman, D. (2020). Senegal’s Top 10 Exports. Workman, D., 2020. Senegal’s Top 10 Exports. [online] World’s Top Exports. Available at: <<http://www.worldstopexports.com/senegals-top-10-exports/>> [Accessed 25 June 2020].

World Bank (2016). Enterprise Survey 2016. [online] Available at: <https://microdata.worldbank.org/index.php/catalog/2810>

World Bank (2018) World Bank - World Development Indicators - Tariff rate, applied, simple mean, all products (%). [online] Available at: <https://data.worldbank.org/indicator/TM.TAX.MRCH.SM.AR.ZS>

World Bank (2020). Municipal Solid Waste Management Project. World Bank. 2020. Municipal Solid Waste Management Project. [online] Available at: <<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/929951579279932576/senegal-municipal-solid-waste-management-project-environmental-and-social-impact-assessments-for-mbeubeuss-and-mbao-executive-summary>> [Accessed 26 June 2020].

World Bank (n.d.). SENEGAL MUNICIPAL SOLID WASTE MANAGEMENT PROJECT (P161477) EXECUTIVE SUMMARY OF THE ENVIRONMENTAL AND SOCIAL ASSESSMENT (ESIA) FOR THE REHABILITATION OF THE MBEUBEUSS DUMPSITE World Bank. 2020. Municipal Solid Waste Management Project. [online] Available at: <<https://documents.worldbank.org/en/publication/documents-reports/documentdetail/929951579279932576/senegal-municipal-solid-waste-management-project>>

environmental-and-social-impact-assessments-for-mbeubeuss-and-mbao-executive-summary> [Accessed 26 June 2020].

World Bank (2020). Senegal: Ameiorer La Gouvernance Et La Gestion Des Dechets. World Bank. 2020. Senegal : Ameiorer La Gouvernance Et La Gestion Des Dechets. [online] Available at: <<https://www.banquemondiale.org/fr/news/press-release/2020/03/05/senegal-to-improve-governance-and-solid-waste-management>> [Accessed 26 June 2020]. World Bank (2020). The Worldbank in Senegal. Available at: <https://www.worldbank.org/en/country/senegal/overview>

World Bank Group (2017). Use of Alternative Fuels in the Cement Sector in Senegal: Opportunities, Challenges and Solutions. World Bank Group (2017) Use of Alternative Fuels in the Cement Sector in Senegal: Opportunities, Challenges and Solutions - <http://documents.worldbank.org/curated/en/249941517382208315/pdf/123075-WP-SN-Senegal-Alternative-Fuels-HI-PUBLIC.pdf>.

World Bank Group (2018). Systematic Country Diagnostic of Senegal. [online] Available at: <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/336611539873310474/senegal-systematic-country-diagnostic>

World Bank(2019). World Bank - World Development Indicators - FDI inflows as share of GDP (%). [online] Available at: <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/336611539873310474/senegal-systematic-country-diagnostic>

World Steel Association (2018). STEEL STATISTICAL YEARBOOK. [ebook] Available at: <https://www.worldsteel.org/en/dam/jcr:e5a8eda5-4b46-4892-856b-00908b5ab492/SSY_2018.pdf> [Accessed 26 June 2020].

World TVET (2015). World TVET Database [ebook] Available at: <https://unevoc.unesco.org/wtdb/worldtvetdatabase_sen_en.pdf> [Accessed 26 June 2020].

Worldbankgroup.org (2020). Improving Urban Transport: 5 Lessons From Senegal. [online] Available at: <<https://ieg.worldbankgroup.org/news/improving-urban-transport-5-lessons-senegal>> [Accessed 26 June 2020].

WTO (n.d.). Senegal and the WTO. [online] available at: https://www.wto.org/english/thewto_e/countries_e/senegal_e.htm

Zerowastesenegal.org. (2020). Qui Sommes Nous. [online] Available at: zerowastesenegal.org.

Chapter 3.2 Modelling

British Geological Survey. 2019. Construction aggregates, Mineral Planning Factsheet. <https://www.bgs.ac.uk/downloads/start.cfm?id=1355#:~:text=Primary%20aggregates%20are%20produced%20from,used%20for%20the%20first%20time>.

Eurostat. 1996. NACE Rev. 1 Statistical classification of economic activities in the European Community. Office for Official Publications of the European Communities, European Commission Luxembourg.

Eurostat. 2008. NACE Rev. 2 Statistical classification of economic activities in the European Community. Office for Official Publications of the European Communities, European Commission Luxembourg.

Eurostat. 2008. Eurostat Manual of Supply, Use and Input-Output Tables. Office for Official Publications of the European Communities, European Commission Luxembourg.

HSBC. 2018. The World in 2030 - Our long-term projections for 75 countries.

International Monetary Fund. 2019. World Economic Outlook: Global Manufacturing Downturn, Rising Trade Barriers. Washington, DC, October.

International Monetary Fund. 2020. World Economic Outlook: The Great Lockdown. Washington, DC, April.

Kanemoto, K., D. Moran, Hertwich, E. 2016. Mapping the Carbon Footprint of Nations. Environmental Science and Technology 10.1021/acs.est.6b03227.

Lenzen M, Kanemoto K; Moran D, and Geschke A. 2012. Mapping the structure of the world economy. Environmental Science & Technology 46(15) pp 8374-8381.

Lenzen, M., Moran, D., Kanemoto, K., Geschke, A. 2013. Building Eora: A Global Multi-regional Input-Output Database at High Country and Sector Resolution. Economic Systems Research, 25:1, 20-49, DOI:10.1080/09535314.2013.769938

UN. 2002. International Standard Industrial Classification of All Economic Activities Revision 3.1. Series M: Miscellaneous Statistical Papers, No. 4 Rev. 3.1, New York: United Nations. ST/ESA/STAT/SER.M/4/REV.3.1

UN. 2007. International Standard Industrial Classification of All Economic Activities Revision 4. Series M: Miscellaneous Statistical Papers, No. 4 Rev. 4, New York: United Nations. ST/ESA/STAT/SER.M/4/REV.4

UN. 2018. Handbook on Supply, Use and Input-Output Tables with Extensions and Applications. Department of Economic and Social Affairs, United Nations, New York.

UNEP. 2018. Africa Waste Management Outlook. United Nations Environment Programme, Nairobi, Kenya.

World Bank. 2018. Decision Maker's Guides for Solid Waste Management Technologies. Urban Development Series Knowledge Papers, World Bank, Washington, DC.

Annex A - Stakeholders

The following stakeholders contributed information in the process of gathering data for the country report:

Table A-1 Contribution of stakeholders

Organisation	Name	Position
AFD (French Agency for Development)	Melanie Grignon	
AFDB - African Development Bank	Arona SOUMARE	Principal climate change and green growth officer, African Development Bank
AFDB - African Development Bank	Davinah MILENGE-UWELLA	Coordinator, Africa NDC Hub, African Development Bank
AFDB - African Development Bank	Melissa Murara	
Association Zéro Déchet Sénégal	Jules Jargot	
Association Zéro Déchet Sénégal	Salimata Bonnaire	President- Association Zéro Déchet Sénégal
CORENVAL	David Dupre La Tour	Gérant de CORENVAL - CONseils en REcyclage ENVironnement et VALorisation des déchets.
CREATE!	Amadou Diouf	Field Coordinator
Copacabana restaurant - Association Zéro Déchet Sénégal	Babacar Thiaw	CEO
CREATE!	Omar Ndiaye Seck	Country Director
DECHEMA e.V. / ISC3 Innovation Hub	Nils Decker	Research and Project Coordination
DELEGATION OF THE EUROPEAN UNION TO SENEGAL	Clarisse Liautaud	Program Manager
Department of Environment and Sustainable Development	Aminata MBOW DIOKHANE	Head of Center for Air Quality Management
Department of Environment and Sustainable Development	Cheikh Fofana	Department of the Environment and Classified Establishments
Department of Environment and Sustainable Development of Senegal	Al Hassane Diop	Director of Green Financing and Partnerships
Eurocham Senegal	Elisabeth Baron	French Delegate, European Investment in Senegal
GLOBAL GREEN GROWTH INSTITUTE (GGGI)	Alé Badara Sy	Urban planner
GLOBAL GREEN GROWTH INSTITUTE (GGGI)	Modou Fall	Program Manager: WEEE
ISC3 International Sustainable Chemistry Collaborative Centre (ISC3)	Dorothee Buerkle	Communications Manager
L'atelier des femmes	Claude Hallegot	CEO
Time for Sense	Kerry Kyd	Director
Urban Mining International Ltd	José Ramon Carbajosa	Int. Expert Recycling/ Circular Economy

Annex B - Policies and legislature for CE

Table B-1 Policies and legislature

	Policy/Law	Goals and impacts
Strategic policy with the potential to drive the Circular Economy	<ul style="list-style-type: none"> Plan Senegal Emergent Priority Action Plan (PAP 2014-2018) Priority Action Plan (PAP 2019-2024) National Strategy for Sustainable Development National Strategic Guidance Document on Green Economy Action Plan for Strategic Guidance on Green Economy 	<ul style="list-style-type: none"> The finalisation of decrees on tax incentives aimed at reducing the high cost of electricity in rural areas, notwithstanding the weak economic capacities of rural populations; The signing of decrees on biofuel blends and uses; The consolidation of national initiatives on the green economy: <ul style="list-style-type: none"> Evaluating implementation of the national strategy for the conservation of biodiversity; Identifying scheduled national contributions to adaptation and mitigation; Formulating the National Strategy for Sustainable Development; Implement the medium- and long-term national Adaptation Plans. Promoting mechanisms for sustainable consumption and production. Opportunity for international community to use these crosscutting mechanisms as one of the main strategic levers to start the greening of its industrial sector.
	<ul style="list-style-type: none"> The Economic, Social, and Environmental Council was established by the Act No. 2012-16 of September 28, 2012 amending the Constitution. 	<ul style="list-style-type: none"> The Economic, Social, and Environmental Council is the second Constitutional Assembly of Senegal. A consultative assembly that may be seized by the President of the Republic, the National Assembly, or the Prime Minister on behalf of the Government to provide advice or studies. The Economic, Social, and Environmental Council enables collaboration and engagement of socio-professional groups in national economic, social, and environmental policies. Monitors progress in economic, social, and environmental matters, and suggests necessary adjustments. Promotes political dialogue and cooperation between local authorities and similar foreign entities.
	<ul style="list-style-type: none"> National Strategic Investment Framework for Sustainable Land Management (CNIS / GDT) 	<ul style="list-style-type: none"> Establish an environment conducive to synergistic support for SLM in Senegal; Promote on a large scale the good practices of SLM to sustainably reverse the process of land degradation; Establish effective systems for acquiring knowledge on the state of land degradation; Strengthen the capacity for action of actors, especially those at the base.
Policies enabling and supporting the	<ul style="list-style-type: none"> National Green Jobs Strategy, part of National 	

	Policy/Law	Goals and impacts
Circular Economy in terms of resource efficiency and green job creation	Employment Policy (2015-2016)	
	<ul style="list-style-type: none"> Letter of Sectorial Policy for the Development of Agriculture (LPSDA) for the period 2019-2023 	
Long term plans and strategies in waste management	<ul style="list-style-type: none"> Environmental Code 2001-01 controls the management and definition of waste 	<ul style="list-style-type: none"> See table B-1 relating articles relevant to the circular economy
Legislation addressing climate change: Pollution and emissions	Ministerial Decree 1220 establishing the National Climate Change Committee (amended by the Decree 2011-1689)	<ul style="list-style-type: none"> The NCCC plays key role in raising awareness and disseminating information on climate change issues, as well as assisting the development of national and local projects within this area. Technological transfer; Energy efficiency; Promotion of renewable energy; Carbon emissions reduction; Capacity building for biodiversity Preservation; Management of marine resources; Pollution management.
	Decree No. 2014-880 on the powers of the Minister of Environment and Sustainable Development	Protecting the environment of Senegal against pollution of any kind and ensuring that polluting activities do not impact the living conditions of the Senegalese people.
	Ministerial Decree No. 9317 National Greenhouse Gas Reduction Programme	Establishes the National Greenhouse Gas Reduction Programme through energy efficiency in the building sector. The overall objective of the programme is to develop energy-efficient practices in the residential and commercial buildings construction sector.
	The 'Ministerial Decree No. 9318 National Programme Steering Committee for Greenhouse Gas reduction	Creates the inter-ministerial National Programme Steering Committee for Greenhouse Gas reduction through energy efficiency in the building sector

Table B-2 Environmental Code 2001-01, articles relevant to the circular economy¹⁹²

Article	
L 30	Definition of “waste” Any solid, liquid, gaseous substance, or residue from a production, transformation, or utilisation destined to be disposed of.
L 31	Any person who produces or holds waste must dispose of or recycle it himself or have it disposed of or recycled by companies approved by the Minister responsible for the environment. If it is not possible, he must hand over the waste to the local authority or to any company approved by the State for waste management. This company, or the local authority itself, may sign contracts with the producers or holders of waste for the elimination or recycling of the waste. Recycling must always be carried out in accordance with the standards in force in Senegal.
L 33	Disposal of waste includes the operations of collection, transport, storage and treatment necessary for the recovery of useful materials or energy, or of any waste dump on the appropriate places, of any other dump under conditions likely to avoid the nuisances mentioned in this law.
L 37	The disposal of waste by industrial, producing and/or processing structures must be carried out under the authorization and supervision of the Ministry in charge of the Environment, which sets requirements. Consumers and consumer associations have an obligation to ensure compliance with waste regulations. The State and local authorities may call on their collaboration for awareness-raising and educational activities.
L 39	It is strictly prohibited to import hazardous waste into Senegal.
L 40	The manufacturing, importation or possession with intent to sell or provide to the consumer of products or materials that generate waste must be regulated by a joint order of the Ministers responsible for trade, the environment and public health, with an order to ease the disposal of such waste or, where necessary, prohibiting it.
L 41	The dumping, incineration or disposal by any process whatsoever of waste in continental, maritime or fluviomaritime waters under Senegalese jurisdiction is prohibited.

¹⁹² Gouvernement Republique du Senegal (2020). Code de l'environnement.

Annex C - Trade and investments in the circular economy in Senegal

This section looks at the level of trade and foreign investments occurring in Senegal and the factors that influence trade and investment. First, an overview will be given on the trends in trade and investment. Subsequently, several economic, financial and political factors that affect the level of trade and foreign investments are investigated.

Overview of ongoing trends in trade and foreign direct investment

A top priority for trade in Senegal is political, technical and financial support for the African Continental Free Trade Agreement (for which EU support already grew from EUR 12.5 Million in 2014-2017 to EUR 60 Million in 2018-2020).¹⁹³ This will enable intra-African trade to support the private sector to transition to sustainable business across their value chains. This will potentially be realised by regional hubs for secondary resources.

Senegal, and Africa, can benefit from EU engagement and knowledge sharing on customs union and single market experience. Cooperation on the strategic corridors that facilitate intra-African and Africa-Europe trade and investment, and improve sustainable, efficient, and safe connectivity between both continents, will also be enhanced by the long-term prospect of creating a comprehensive continent-to-continent free-trade area.¹⁹⁴

Senegal is a founding member of the WTO (in 1995)¹⁹⁵ and in addition part of the Economic Community of Central African states (ECCAS), the West African Economic and Monetary Union UEMOA and the Community of West African States (ECOWAS), which in 2014 negotiated a regional economic partnership agreement (EPA) with the European Union (EU).¹⁹⁶ The EPA has not been signed by all West African countries but Senegal has non-reciprocal preferential access to the EU market under the "Everything But Arms" initiative.

Trends in trade

Senegal's relative level of trade with other countries was 58% of the country's GDP in 2018. This is comparable to the world average (59%), higher than the average Sub-Saharan Africa trade level (54%) and lower than the average trade level in the MENA region (86%). In the period 2010-2018, Senegal's share of total trade has been very similar to the average world share of total trade.

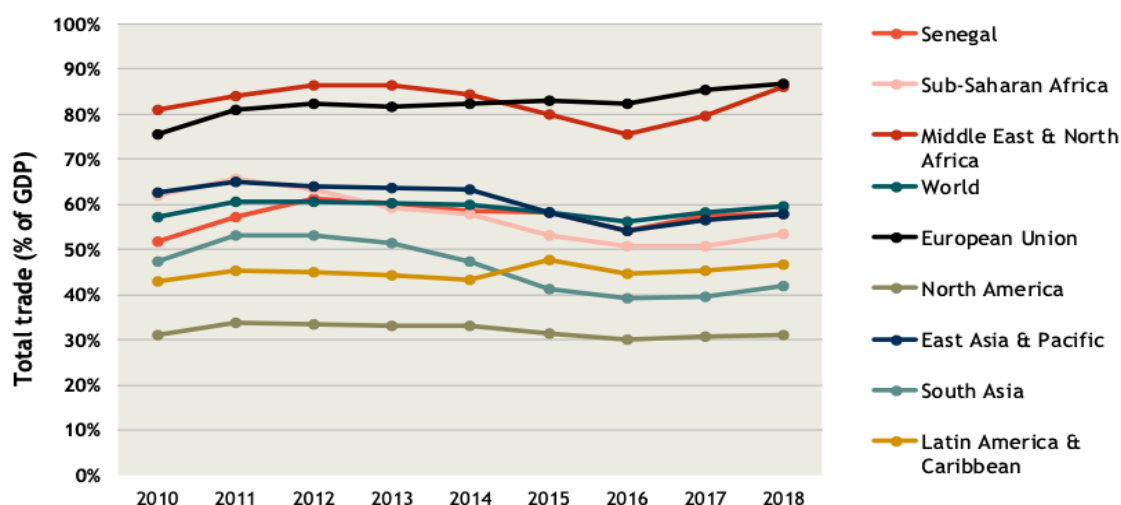
¹⁹³ Conference regionale de haut niveau Economie circulaire, emplois, industries vertes Dakar les 22 et 23 juillet 2019.

¹⁹⁴ *ibid.*

¹⁹⁵ WTO (n.d.). Senegal and the WTO.

¹⁹⁶ International Trade Centre (2014). Senegal.

Figure C-1 Share of total trade (Imports+exports) in GDP (%) in Senegal compared to regional averages for the period 2010-2018



Source: World Bank - World Development Indicators - Trade (% of GDP)

In 2018, around 15% of Senegal's exports were destined for the EU while 38% of Senegal's imports originated from the EU. The share of exports from Senegal to the EU has been stable in the last decade while the share of EU imports to Senegal have decreased (they were 44% in 2010).¹⁹⁷ In 2018 Senegal accounted for approximately 0.1% of the total Extra-EU trade of the EU, more specifically, 0.17% of the extra-EU exports were to Senegal, and 0.03% of the extra-EU imports originated from Senegal.¹⁹⁸

When looking at the EU's imports from outside the EU, we see that Africa accounted for 5% of those imports in 2018, of which in turn 0.4% comes from Senegal. Senegal ranks as the 9th African export partner for the EU and as the EU's 24th African import partner.

Trade in environmental goods and services

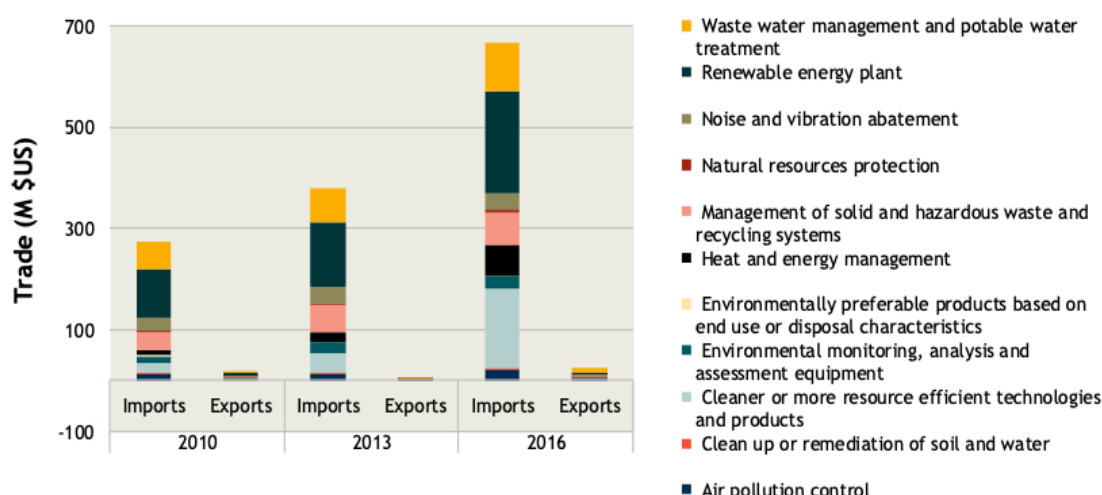
In the late 1990s, the OECD developed a list of sectors that deliver (as part of their output) environmental goods and services. In several economic databases the level of activity in these environmental goods and services sectors are monitored, to provide a proxy of the volume of trade in environment-related goods and services. It is important to note though, that in reality only part of the goods and services that are generated in these sectors are related to the environment.

In Senegal in 2010, the environmental goods and services sectors accounted for 4% of the total trade volume and over the years this share increased to 7% in 2016. As seen in Figure C-2, trade in environmental goods and services is limited to imports, where renewable energy technologies, water treatment technologies and waste management systems have accounted for the largest part of the imports in the period 2010-2013 while renewable energy technologies and cleaner / more resource efficient technologies and products have dominated in the period 2014-2016. The Emergent Senegal Plan, which came into effect in 2012, drives local investment in infrastructures for greening the country. This explains the upward trajectory of trade in environmental goods and services.

¹⁹⁷ UN Comtrade.

¹⁹⁸ Eurostat - International trade in goods by partner.

Figure C-2 Imports and exports of environmental goods and services in Senegal in 2010, 2013 and 2016

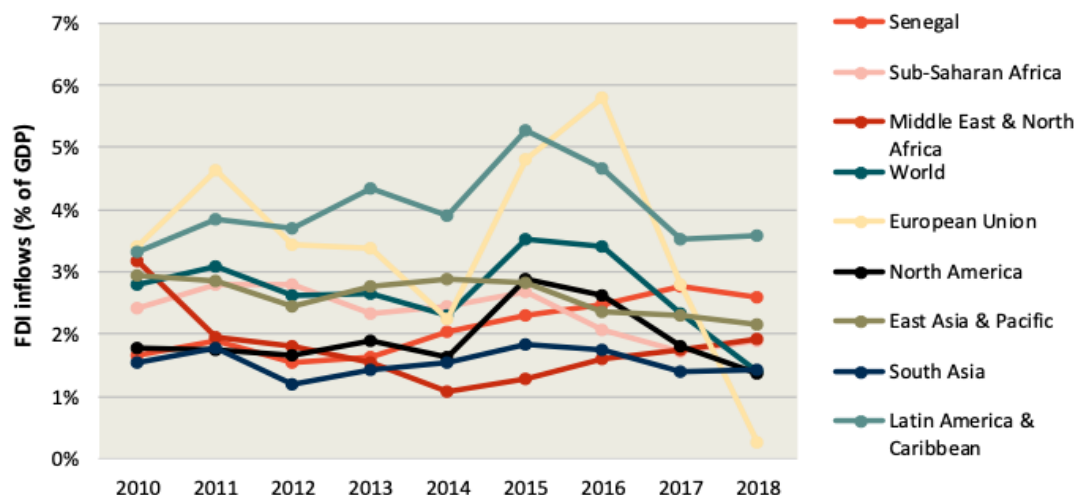


Source: OECD - Trade in Environmental goods and services

Foreign direct investment

The foreign direct investment (FDI) rate in Senegal in 2018 was almost 3%, above the average rates of Sub-Saharan Africa (2%), the MENA region (2%) and the world (1%). The trendline shows a positive picture with a steady growth in FDI from almost 2% in 2010 to almost 3% in 2018. Until 2017, FDI rates in Senegal were below world average levels and until 2016, below Sub-Saharan Africa levels. The Senegalese economy remains highly dependent on European growth. Since 2014, FDI inflows have been linked to the Emerging Senegal Plan for the development of infrastructure, electricity, agriculture, drinking water and health. Some of the key investors in the country include France, Morocco, Indonesia, and the United States.¹⁹⁹

Figure C-3 Share of Foreign Direct Investment (inflows) in Senegal as share of GDP (%)



Source: World Bank - World Development Indicators - FDI inflows as share of GDP (%)

In conclusion, there is substantial trade between Senegal and its international trading partners, with a share of trade in the total economic output similar to the world average. Environmental goods and services are primarily imported. In terms of foreign investments, Senegal is doing relatively well, with investments steadily growing the last few years, and current FDI at levels above the world average and other relevant regions' average.

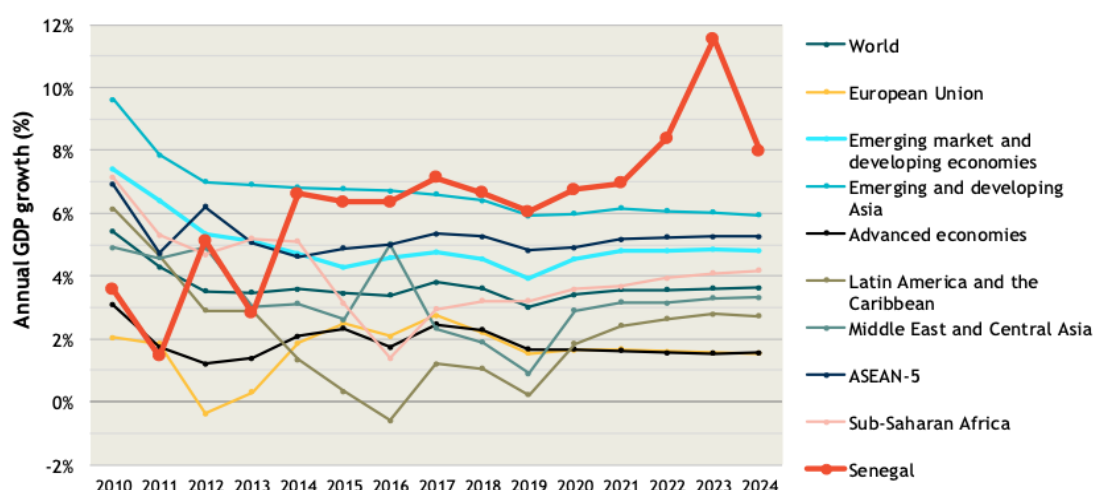
¹⁹⁹ Lloyds Bank (2020). Foreign direct investment (FDI) in Senegal.

Opportunities and barriers for investments

Economic opportunity

As shown in Figure C-4, growth rates (annual GDP growth in %) in Senegal in the past decade have been volatile but following an upward trend overall. Annual GDP growth increased from below 4% in 2010 to 7% in 2018. Economic growth has been volatile though, with fast growth followed by fast economic turn downs every couple of years. The lowest point was reached in 2011 when GDP growth rate was 1%. Following deteriorating economic management marking the period between 2005 and 2012, a new administration pursued sounder macro-economic policies, implemented critical infrastructural investment and initiated several reforms aimed at enhancing overall economic governance, the business environment and performance of specific sectors (such as liberalising the groundnut market, opening up the energy sector to independent power producers and the cement sector to new private sector players, restructuring the Chemical Industries of Senegal, and liquidating a loss-making semi-public airline).²⁰⁰ The current situation and future outlook regarding the economic situation in Senegal, according to the IMF, looks more stable. The exponential growth predicted between 2021 and 2023, reaching an annual growth rate of almost 12% by 2023, mainly due to expected oil production, will have to be re-assessed to take into account the contracted oil sector and other Covid-19 impacts.

Figure C-4 Historical GDP growth and growth outlook until 2024 for Senegal, compared to global and regional averages



Source: International Monetary Fund - World Economic Outlook

Governance, political stability and regulatory quality

Political instability & security

Since gaining independence from French rule in 1960, Senegal has enjoyed its status as the region's oldest and most stable democracy, thanks to peaceful transitions of power. Senegal remains the only country in West Africa to have never experienced a military coup or civil war. It has not been affected by regional security shocks but increasing activism by terrorist groups in neighbouring countries and the higher number of radicals entering the country are factors that risk fuelling instability.²⁰¹

According to the World Bank's enterprise survey (2014 edition)²⁰², political instability is not a problem that many entrepreneurs identify. With just 0.2% of the respondents identifying this as an issue when doing business in Senegal, political instability does not fall within the top 10 most important obstacles for business.

²⁰⁰ World Bank Group (2018). Systematic Country Diagnostic of Senegal.

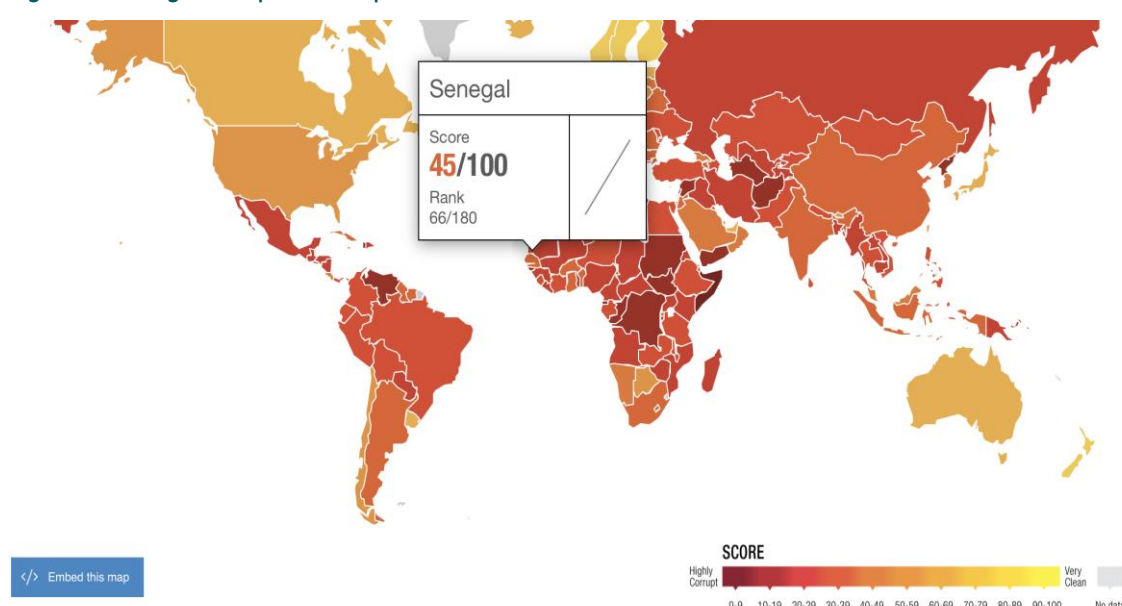
²⁰¹ The World Bank (2020). The World Bank in Senegal.

²⁰² Most recent available data.

Corruption

Corruption is still a problem in Senegal, which hampers the economy and acts as a barrier for foreign companies to invest in the country. In the global Corruption Perception Index of 2018 assessing ‘the lowest level of corruption’ Senegal ranks 67th, with a score of 45 on a scale from 0-100 (most corrupt to least corrupt) (Figure C-5). Senegal has climbed 9 points in Transparency International’s ‘Corruption Perceptions index – 2 points above the global average.²⁰³ Presidential policies implemented likely cause of rise²⁰⁴: anti-corruption institution and declaration promoting transparency. Within Africa, Senegal has a shared 20th place, when ranking for the lowest level of corruption. As such, Senegal scores better than Morocco, South Africa, Ghana, Egypt, Kenya and Nigeria, and worse than Rwanda. In the enterprise survey conducted in 2016 by the World Bank, corruption was mentioned by around 4% of the respondents as the most important obstacle to doing business in Senegal and 27% of the respondents identified it as a major constraint.

Figure C-5 Senegal Corruption Perception Index score



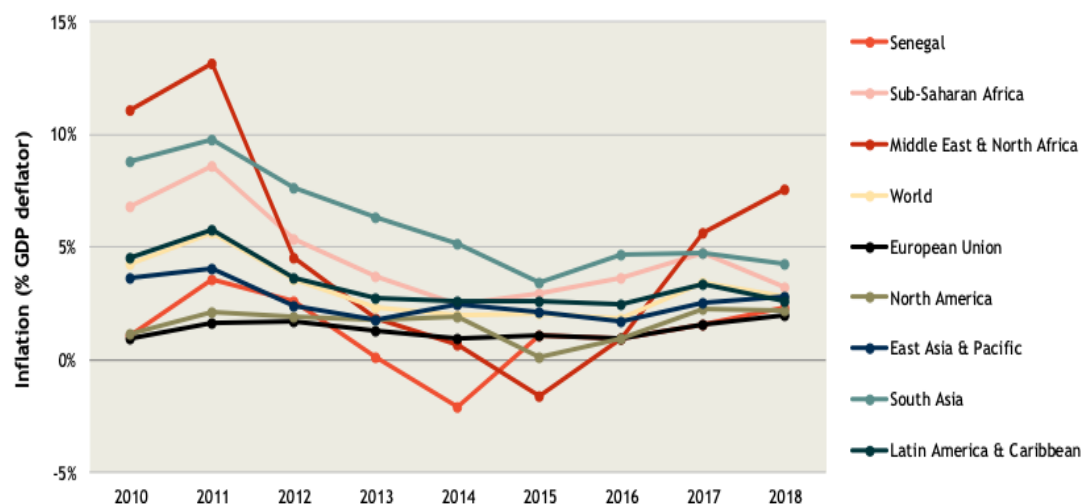
Financial stability

Inflation

Inflation rates in Senegal have been relatively low (1% on average in the period 2010-2018) in comparison to the averages in other relevant regions and the world. Overall, in the period 2010-2018, inflation rates in the Senegal have been lower than in Sub-Saharan Africa on average, and in the world on average. After a period when inflation rates steadily decreased (from 4% in 2011 to -2% in 2014), inflation rates have followed an upward trend again to reach 2% in 2018. This is comparable to the average inflation rates in the world, in Sub-Saharan Africa, in Europe and in North America, and four times lower than the inflation rate in the MENA region in 2018 (8%).

²⁰³ Transparency International (2019). Corruption Perception Index.

²⁰⁴ Sustainability Times (2019). Senegal: Africa’s new waste warrior?.

Figure C-6 Historical trends in inflation (GDP deflator %) in Senegal compared to global, regional and continental averages

Source: World Bank - World Development Indicators - Inflation, GDP deflator (annual %)

National creditworthiness

Whereas the inflation rate reflects the monetary stability in a country, the creditworthiness reflects the stability and sustainability of public finance. Of the eighteen African countries that have recently received a credit rating from the rating agency Standard & Poor's, the majority of the countries received a B rating, whereas the lowest rating of CCC+ was given to two countries (Table C-1). On the high side of the spectrum, three countries received a B+ rating. Senegal's rating was B+, meaning that the country performs better than the African average. The rating agency also thinks that the rating will remain stable in the future. Moody's credit rating for Senegal was last set at Ba3 with stable outlook.

Table C-1 Most recent credit ratings by Standard & Poor's for African countries (N=18) with Morocco's rating highlighted in orange

S&P	# countries
A-	0
B+	3
B	5
B-	3
BB-	1
BBB+	1
BBB-	1
CCC	1
CCC+	3

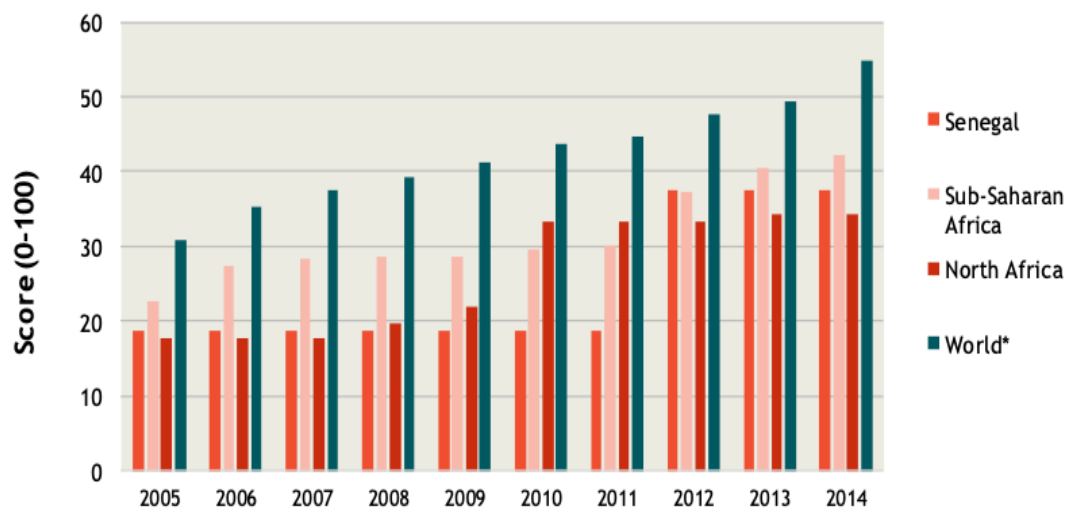
Source: Countryeconomy.com (n.d.). Sovereigns Ratings List

Ease of getting credit

For many African countries, access to finance is an important obstacle for people and organisations that want to start up a business. The World Bank's indicator on the ease of getting a credit indicates that obtaining credit in Senegal currently is more difficult than on average in the world and in Sub-Saharan

Africa, but easier than in North Africa. Since 2005 until 2011 Senegal scored very poorly on this indicator with a stable score below 20 (out of 100). In 2012, the score drastically improved to 38 and has remained stable until 2014. In the enterprise survey conducted by the World Bank in 2014, the lack of access to finance was considered the #1 obstacle to doing business in the country.

Figure C-7 Senegal's score (0-100 scale) for the ease of getting credit compared to global and regional averages



Source: World Bank - Ease of doing business - Getting credit (DB05-14 methodology) - Score

The process of business creation has been eased in Senegal, to facilitate the integration of small, previously informal businesses. There is little integration of the informal sector in formal business doings, and the easing of process to formal business hopes to enable more actors in the formal economy. In many sectors, the informal sector is seen as unfair competition, it harms formal enterprises.²⁰⁵

²⁰⁵ Reference: Elisabeth Baron, EuroCham, telephonic interview 22 May 2020.

Annex D - Method for modelling of impacts

Part 1 Methodological details of the modelling approach

The FRAMES model

The process of estimating economic and jobs impacts of circular economy activities in Senegal was carried out using Cambridge Econometrics' FRAMES model. The direct, indirect, and induced impacts of additional circular economy activities are captured in this modelling framework, to estimate the full impacts of the circular economy transition in Senegal.

FRAMES, the Framework for Modelling Economies and Sustainability, is an advanced input-output tool. It is designed to enable the assessment of socioeconomic and environmental effects of E3 (energy, environment, and economy) policies.

The key features of FRAMES are:

- An economic accounting framework based on the system of national accounts.
- Integrated treatment of the economy, energy, and the environment.
- Detailed sectoral disaggregation, and a national level input-output table, reflecting the specific structure of the economy.

FRAMES was built using the structure and principles of the E3ME model. E3ME is a global, macro-econometric model of the world's economic and energy systems and the environment. FRAMES, as a single-country framework, was designed to minimise data requirements, to enable modelling work for regions where time series data are limited. The data requirements are substantially lower than more complex macroeconomic models like E3ME. Table D-1 summarises the data sources used to construct FRAMES.

Table D-1 Scenario design

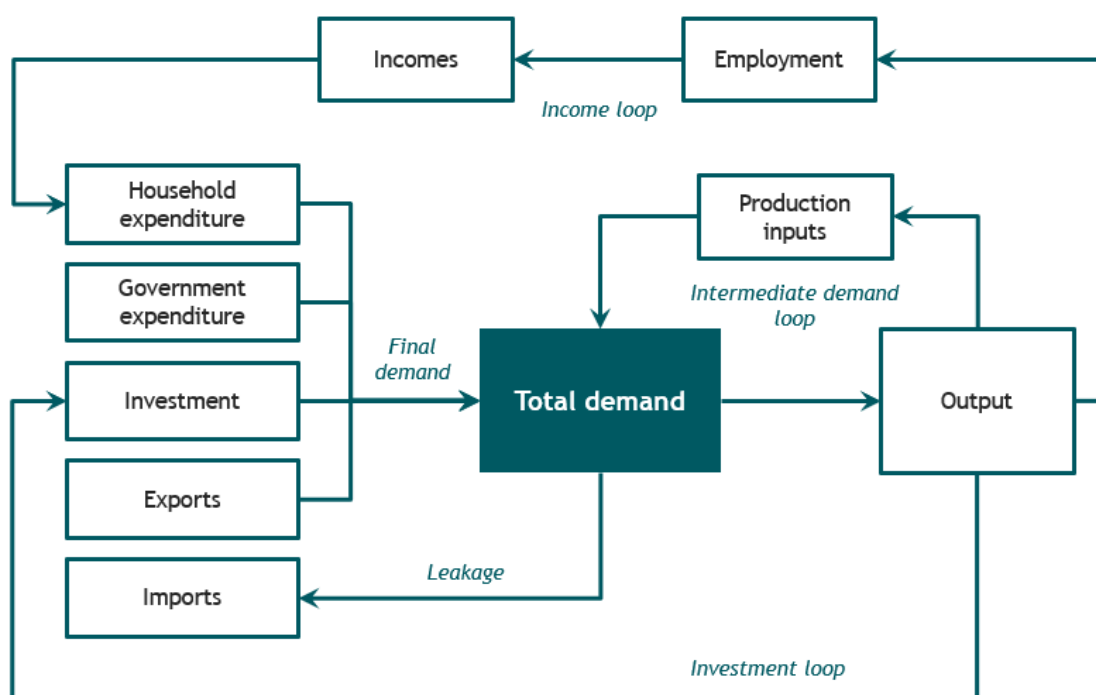
Data	Variables	Source(s)
National accounts	<ul style="list-style-type: none"> • GDP • GVA • Consumption • Investment • Trade • Gross output 	<ul style="list-style-type: none"> • World Bank - World Development Indicators • Eora National IO Tables - Senegal (2015)
Employment	<ul style="list-style-type: none"> • Employment • Compensation of employees 	<ul style="list-style-type: none"> • International Labour Organisation • Eora National IO Tables - Senegal (2015)
Population	<ul style="list-style-type: none"> • Current population • Population forecast 	<ul style="list-style-type: none"> • United Nations - Population Division
Energy	<ul style="list-style-type: none"> • Final energy consumption • Primary energy consumption 	<ul style="list-style-type: none"> • International Energy Agency • Eora National IO Tables - Senegal (2015)
Environmental	<ul style="list-style-type: none"> • Emission coefficients 	<ul style="list-style-type: none"> • E3ME
Economic forecast	<ul style="list-style-type: none"> • GDP forecast 	<ul style="list-style-type: none"> • International Monetary Fund (2019, 2020) • HSBC (2018)

The input-output table used to model the structure of the Senegalese economy was sourced from the Eora National IO Tables database. The economic sectoral classification follows this source input-output table, which includes the following 26 economic sectors:

- | | |
|--|--|
| 1. Agriculture | 16. Wholesale Trade |
| 2. Fishing | 17. Retail Trade |
| 3. Mining and Quarrying | 18. Hotels and Restaurants |
| 4. Food & Beverages | 19. Transport |
| 5. Textiles and Wearing Apparel | 20. Post and Telecommunications |
| 6. Wood and Paper | 21. Financial Intermediation and Business Activities |
| 7. Petroleum, Chemical and Non-Metallic Mineral Products | 22. Public Administration |
| 8. Metal Products | 23. Education, Health and Other Services |
| 9. Electrical and Machinery | 24. Private Households |
| 10. Transport Equipment | 25. Others |
| 11. Other Manufacturing | 26. Re-export & Re-import |
| 12. Recycling | |
| 13. Electricity, Gas and Water | |
| 14. Construction | |
| 15. Maintenance and Repair | |

Table D-2 illustrates the economic structure and key relationships in FRAMES. Key parameters estimating the magnitude of relationships were taken from E3ME, specifically an aggregate 'Rest of Africa' region.

Table D-2 Economic Structure in FRAMES



Treatment of the informal sector

The informal sector is an important consideration when modelling circular economy activities in Africa, as much economic activity may not be fully recorded in official national statistics. This issue is most relevant to agriculture, given the importance of smallholder agriculture in many African countries.

Our employment results include informal labour, as they are based on International Labour Organisation (ILO) data which estimate informal activity. The economic results in FRAMES are calibrated to World Bank economic aggregate data, which also incorporate estimates of the informal sector. However, the input-output relationships and sectoral shares in FRAMES are drawn from Eora's National IO Tables, which do not capture informal economic activity. The EORA data therefore required some adjustments to match the ILO and World Bank data, namely by adjusting GVA, wages and household consumption in the agricultural sector to align with World Bank data on GVA shares by sector. The implicit assumption of

this adjustment is that the products of informal agriculture are entirely purchased by other households, and the value added from these sales are entirely channelled into labourers' wages (as opposed to profits or taxes).²⁰⁶

Scenario design

FRAMES has been designed to be used for scenario analysis, evaluating the impacts of an input shock to a reference scenario. An input shock may be either a change in policy, a change in economic assumptions or another change to a model variable. By comparing different scenarios – each representing an alternative future with different policies and/or economic assumptions – it is possible to assess the impact of a change in policies and/or economic assumptions. For this report, the following scenarios were modelled: a baseline and a circular economy (CE) scenario with a scale of circularity on top of the level embedded in the baseline, as shown in Table D-3.

Table D-3 Scenario design

Scenario	Scenario Description
Baseline	A baseline constructed based on official published economic and energy-sector projections. The modelling baseline does not explicitly assume a certain level of circular economy activities.
Circular Economy	This scenario assumes an ambitious uptake of the circular economy, in addition to the baseline scenario. The base year for the modelling is 2020 and the target year is 2030.

We have adopted an 'activities' approach (rather than a 'policies' approach) to modelling the CE scenario. This choice means that the analysis does not assess potential impacts of specific policies but instead looks directly at the links between specific changes in an economy and the direct, indirect and induced effects, without making any explicit assumptions about whether these changes are driven by policies, behavioural change or new technology.

The activities approach implies generating modelling inputs from a sectoral perspective. Inputs are formed by studying the plausible circular economy activities that will take place in selected key sectors and their supply chains. This is to reflect that the impact of a transition to a more circular economy will vary between sectors, as sectors differ in the way in which resource flows and relationships with the consumer are organised.

Increased waste collection and recycling are modelled as central circular economy activities. In addition, activities for four additional sectors are modelled, selected based on existing policy priorities, but also on the basis of the anticipated scale of the potential benefits (in consultation with country experts): electronics (e-waste), plastics, agriculture and construction.

The selected activities are translated into modelling inputs and methods, so that the economic, social and environmental impact can be simulated in FRAMES. Together, the selected activities should be broad enough to represent the most important circular economy changes and their potential impacts.

²⁰⁶ For smallholder farmers, there is of course little distinction between wages and profits anyway.

Scenario assumptions

Table D-4 provides a summary of the selected circular economy activities and how the identified circular economy activities were translated to modelling inputs that have been implemented in FRAMES.

Table D-4 Scenario assumptions

Category	Circular economy activity	Modelling input	Input size
Waste management	Improved waste collection rate	Increase in waste sector output	Increase from 55% to 95%
E-waste	Improved enforcement of e-waste trade restrictions	Reduction in e-waste (i.e. electronics) imports	EUR 17.2m
	Improved recycling of valuable materials in e-waste	Investment in recycling sector to improve health & safety standards	EUR 300,000
		Share of recycling investment paid for by private and public sectors	50:50
		Exports of materials recovered from e-waste recycling	EUR 720,000
Agriculture	Prevention of food loss in agricultural supply chain through improved storage and logistics	Substitution of agricultural imports by domestic agricultural production	EUR 131m
		Investment in storage and logistical capabilities	EUR 39m
		Share of investment paid for by private and public sectors	50:50
Circular production	Increased use of recycled materials in industrial production	Electronics production: shift from virgin metals and plastics inputs to recycled inputs	20% of virgin inputs replaced by recycled inputs
		Plastics production: shift from virgin feedstock to recycled feedstock	25% of virgin inputs replaced by recycled inputs
		Construction: shift from virgin non-metallic minerals (glass, cement, sands, ceramics) to recycled minerals	10% of virgin inputs replaced by recycled inputs
		Agricultural production: shift from mineral fertilisers to organic fertilisers	20% of mineral fertiliser replaced by organic fertiliser

As indicated in the last two columns, the various economic changes associated with the circular economy are modelled through specific input assumptions. They mainly relate to gross output, input-output coefficients, investment and the trade balance.

Gross output

The increase in the waste collection rate is modelled as a change in output in the waste management sector. This increase in gross output can be thought of as resulting from a government mandate, rather than being caused by an increase in a component of demand.

Input-output linkages (intermediate demand between sectors)

We have modelled an increase in the circularity of production for a number of sectors through adjustments to the existing input-output structure of the model. This reflects changes to the supply chain of a sector as a result of higher circular economic activities. For example, if the construction sector uses less primary aggregate material, and substitutes these for recycled materials, this change is entered to FRAMES as an adjustment to the input-output linkages (i.e. coefficients) of the construction sector: it purchases less from the mining and non-metallic mineral sectors and more from the recycling sector.

Investment

Some of the modelled circular economy activities are associated with an increase in investment, such as the investment required to prevent food losses in the agricultural sector, or to increase health and safety in the recycling sector. In these cases, assumptions are also needed regarding the share of the investment costs that will be paid by the private and public (or aid) sectors: we have assumed a 50:50 split in all cases. In practice, this means that 50% of the investment input is represented as a cost to the investing industry; the other 50% is assumed to be funded by deficit spending or official development assistance, and is thus represented as an injection of funds into the economy.

Trade balance changes

In some cases, the modelled changes to the trade balances represent circular economy activities which directly relate to the trade balance, such as the reduction in imports of e-waste. In other cases, changes to the trade balance are a way to represent a change in productivity in a demand-led model. For instance, we have modelled a reduction in food losses in the agricultural supply chain (effectively an increase in agricultural productivity) as a reduction in imports of agricultural products, as domestic supply is better able to meet domestic demand. Similarly, some portion of the materials recovered from e-waste recycling are modelled as an increase in exports, as we do not assume that domestic demand for these materials has necessarily increased.

Mapping inputs to FRAMES sectors

In some cases, the sectors available in FRAMES were too broad to allow for the targeting of inputs at the level described in Table D-4 above. For example, modelling the shift from virgin plastics to recycled plastics as inputs to the production of electronics requires the disaggregation of two FRAMES sectors. Firstly, we must establish the share of electronics output within the broader “Electrical and Machinery” FRAMES sector. Secondly, we must establish what share of this sector’s purchases from the “Petroleum, Chemical and Non-Metallic Mineral Products” FRAMES sector are actually of plastics, as opposed to other petrochemical and mineral products. Once these shares are established, the magnitude of the modelling inputs can be adjusted accordingly.

Table D-4 provides an overview of how each of the modelled activities corresponded to the sectors available in FRAMES. An estimate of output or intermediate demand shares was required in cases where the activity sector did not correspond directly with the FRAMES sector. These shares were estimated, where possible, using data from the relevant national accounts and other sources. If no data were available, the shares were inferred using data for the “Rest of Africa” region in E3ME.

Table D-5 Mapping to FRAMES sectors

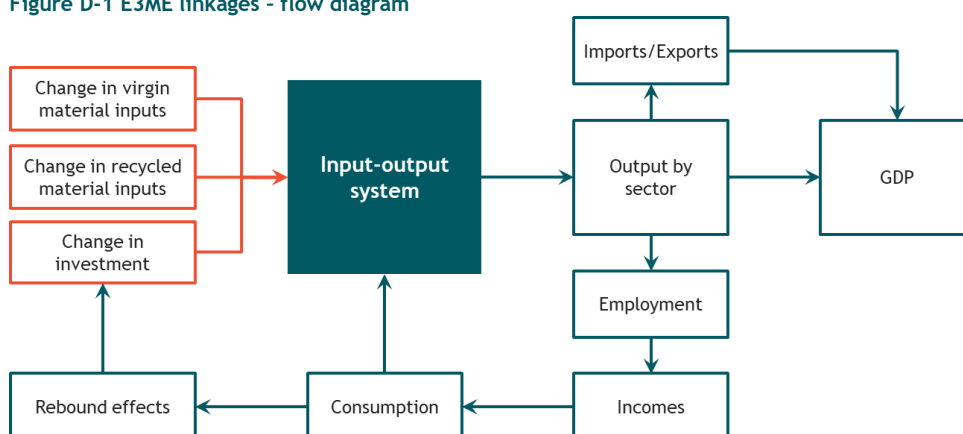
Activity sector	FRAMES Sector	Variables affected by modelling inputs
Waste management	Education, Health and Other Services	Gross output
Recycling	Recycling	IO coefficients, Investment, Exports
Electronics	Electrical and Machinery	IO coefficients, Imports
Plastics	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients
Construction	Construction	IO coefficients
Agriculture	Agriculture	IO coefficients, Investment
Metals	Metal Products	IO coefficients (electronics input)
Chemicals	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients (plastic feedstock, mineral fertilisers)
Mining of non-metallic minerals	Mining and Quarrying	IO coefficients (construction materials)
Production of non-metallic minerals	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients (construction materials)

Model linkages and feedbacks

The impact of circular economy activities will not be linear. A change in investment or material consumption may have feedback effects that may in turn alter investment and consumption levels. An advanced input-output model like FRAMES is able to capture these complex interactions, enabling a deeper analysis of the trade-offs inherent in a circular economy transition, as limits are placed on certain economic activities while demand for others increases.

Figure D-1 illustrates the key linkages in modelling material demand substitution in FRAMES. The modelling inputs adjust input-output coefficients in select sectors, substituting demand away from extractive sectors, towards the recycling sector. This shift in the value of supply-chains affects intermediate demand across sectors, and as a result, levels of gross output across sectors. Differences in output levels result in employment changes by sector; variation in labour intensities across sectors affects net employment change. Output changes across sectors also affect levels of trade and investment activity. Induced effects result from changes in employment, which affect incomes, and therefore consumption.

Figure D-1 E3ME linkages - flow diagram



The net environmental impacts of circular economy activities are not certain, a priori. For instance, the shift towards recycled materials will decrease the share of material use in the economy met by virgin material. On the other hand, the shift towards recycled materials may also be associated with increased employment, increasing disposable incomes and consumption. The additional investment required by the transition would also filter through the economy, increasing demand in the financial and construction industries, among others.

The overall consumption of raw materials is determined by these trade-offs within the economy. If the rebound effects from the additional demand are strong, the impact of circular economy activities may be to increase the extraction of raw materials more than ever, with improved resource efficiency offset by higher consumption overall. As the relative importance of sectors with different labour and carbon intensities changes as a result of the circular economy, we may expect to see similar dynamics in terms of employment and carbon emissions in aggregate, with employment and carbon emissions being added in certain areas of the economy while employment and emissions potentially being reduced in other areas of the economy. Through its model linkages and feedbacks, FRAMES captures these various effects and estimates the net impacts.

Part 2 - Detailed modelling results

Table D-6 Detailed employment results by sector

Sector	Baseline scenario employment, 2030 (000s)	CE scenario employment, 2030 (000s)	Absolute difference from baseline scenario in 2030 (000s)	Relative difference from baseline scenario in 2030 (%)
1. Agriculture	1511.4	1517.1	5.75	0.38%
2. Fishing	121.6	121.7	0.03	0.03%
3. Mining and Quarrying	35.2	35.2	0.00	0.01%
4. Food & Beverages	34.5	34.5	0.00	0.00%
5. Textiles and Wearing Apparel	12.3	12.3	0.01	0.09%
6. Wood and Paper	37.1	37.1	0.00	0.00%
7. Petroleum, Chemical and Non-Metallic Mineral Products	55.6	55.6	-0.01	-0.01%
8. Metal Products	41.5	41.4	-0.07	-0.18%
9. Electrical and Machinery	101.7	101.9	0.15	0.15%
10. Transport Equipment	25.6	25.6	0.02	0.06%
11. Other Manufacturing	13.6	13.6	0.00	0.00%
12. Recycling	1.0	1.1	0.07	6.60%
13. Electricity, Gas and Water	27.8	27.8	0.00	0.01%
14. Construction	326.7	327.4	0.63	0.19%
15. Maintenance and Repair	24.9	24.9	0.00	0.00%
16. Wholesale Trade	572.5	572.5	0.00	0.00%
17. Retail Trade	487.8	487.8	0.00	0.00%
18. Hotels and Restaurants	105.0	105.0	0.00	0.00%
19. Transport	131.6	131.6	0.07	0.05%
20. Post and Telecommunications	134.1	134.6	0.45	0.34%
21. Financial Intermediation and Business Activities	121.9	122.2	0.28	0.23%
22. Public Administration	145.3	145.3	0.00	0.00%
23. Education, Health and Other Services	321.5	322.4	0.86	0.27%
24. Private Households	658.3	658.3	0.00	0.00%
25. Others	269.5	269.5	0.00	0.00%
TOTAL	5318.3	5326.5	8.24	0.15%

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