



Circular Economy in Africa-EU cooperation

Country report for Egypt



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Contact: Gaëtan Ducroux

E-mail: ENV-U13-ADONIS@ec.europa.eu

*European Commission
B-1049 Brussels*

Circular Economy in Africa-EU Cooperation

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Authors: Mahmoud, M; Rademaekers, K.; Hemkhaus, M.; Ahlers, J.; Van Hummelen, S.; Chewpreecha, U.; Smith, A. & McGovern, M.

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Acronyms

AA	EU-Egypt Association Agreement
ACAA	Agreement on Conformity Assessment and Acceptance
ACEN	African Circular Economy Network
AfD	Agence Francaise De Developpment
AfDB	African Development bank
AFOLU	Agriculture, Forestry and Other Land Use
B2B	Business-to-business
BCI	Better Cotton Initiative
BITs	bilateral investment treaties
	Strategic Research Marine and Maritime Research and Innovation Agenda for Blue Growth
BLUEMED	
BMZ	German Ministry for Economic Cooperation and Development
BUR	Biennial Update Report
CAPMAS	Egyptian Central Agency for Public Mobilization and Statistics
CCCD	Climate Change Central Department
CE	Circular economy
CEDARE	Centre for Environment and Development for the Arab Region and Europe
CEEBA	Confederation of Egyptian European Business Associations
COP	Conference of the Parties
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECO-FEI	Environmental Compliance Office - Federation of Egyptian Industries
EEAA	Egyptian Environmental Affairs Agency
EFI	European Financial Institutions
EHA	Egyptian Hotel Association
EIB	European Investment Bank
ENCPC	Egyptian National Cleaner Production Centre
ENP	European Neighbourhood Policy
EOS	Egyptian Organization for Standards and Quality
EPR	Extended Producer Responsibility
ETF	European Training Foundation
EU	European Union
EU-MED GSO	EuroMediterranean Group of Senior Officials in Research and Innovation
FAO	United Nations Food and Agriculture Organisation
FDI	Foreign direct investment
FP6	Sixth Framework Programme
FRAMES	Framework for Modelling Economies and Sustainability
GDP	Gross Domestic Product
GHG	Greenhouse gases
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GSH	Green Star Hotel
HCWW	Egyptian Holding Company for Water and Wastewater
IE2/IE3	High Efficiency Motors
IEE	Industrial Energy Efficiency

IMC	Industrial Modernisation Centre
INDC	Intended Nationally Determined Contributions
IPPU	Industrial Processes and Product Use
IWEX	Industrial Waste Management & SMEs Entrepreneurship Hub in Egypt
KfW	German Bank for Reconstruction
MENA	Middle East North Africa
MOE	Ministry of Environment
MSMEDA	Egyptian Micro, Small and Medium Enterprise Development Agency
MSMEs	Micro Small and Medium Enterprises
MSW	Municipal solid waste
NCCC	National Climate Change Council
NGER	National Green Economy Reviews
NSWMP	National Solid Waste Management Program
PPs	Partnership Priorities
PRIMA	Partnership for Research and Innovation in the Mediterranean Area
RDF	Refuse Derived Fuel
RDI	Research, Development and Innovation
RECP	Resource Efficient and Cleaner Production
RMG/T	Ready-made garments/textile
rPET	recycled polyethylene terephthalate
SADS	Sustainable Agriculture Development Strategy
SCP	Egypt's National Action Plan for Sustainable Consumption
SCP/RAC	Regional Activity Centre for Sustainable Consumption and Production
SDGs	Sustainable Development Goals
SDS	sustainable Development Strategy
SECO	State Secretariat for Economic Affairs
SSF	Single Support Framework
TEST	transfers environmentally sound technologies
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
WMRA	Waste management regulatory authority
WVO	Waste Vegetable Oil

Executive Summary

The Egyptian economy is majorly dominated by the services sector that contributed to around 56% to the GDP in 2019, followed by the industry sector that contributed to around 32.6% and lastly the agriculture, forestry and fisheries sector contributing to around 11.4% to the GDP in 2019. The share of industry's contribution to the GDP remained relatively constant from 2000 to 2019, while the share of agricultural, forestry and fisheries sector decreasing from 17% in 2000 to approximately 11.4% in 2019, and the share of services sector increased from approximately 50% in 2000 to 56% in 2019. The macro-economic and structural reforms that took place over the last 5 years by the Egyptian government supported the stabilization of the economy and sustained its growth. These reforms included: reducing energy subsidies, reforming the industrial licensing regime and taxes reforms, which resulted in a slight increase in the GDP from 5.3% in 2018 to 5.6% in 2019, associated with decrease in the unemployment rate to 7.5% in 2019 compared to 9.9% in 2018. However, these reforms did not improve the social conditions due to the high inflation rates from 2016 to 2018 because of the currency floatation.

Status of Circular Economy in Egypt

Circular economy (CE) has not been addressed separately yet in the national policies and strategies of Egypt. However, the concept has been embedded in different national policies and strategies such as the Sustainable Development Strategy of Egypt (SDS) 2030, sustainable and green growth strategy (as a part of Egypt's Sustainable competitiveness strategy), the National Solid Waste Management Program (NSWMP) and the national sustainable consumption and production action plan. These strategies can act as a starting point for circular economy in Egypt. However, such strategies are not considered sufficient to support the transition towards circular economy in Egypt.

The government of Egypt has identified priority sectors in the sustainable and green growth strategy and the national sustainable consumption and production action plan, which can be considered as a starting point for a transition to CE. These sectors are agriculture, industry sectors such as textiles, plastics, and agri-food, waste, transportation, building and housing, and the tourism sector. Moreover, the practices of water reuse (by renewable ground water extraction, wastewater reuse and agriculture drainage reuse), which has been already implemented in Egypt for more than 2 decades, will play an important role in the coming period, given the reduced water supply from the Nile river which represents 95% of the water resources in Egypt.

When discussing the CE trends in Egypt from a lifecycle perspective Egypt's resource extraction has been steadily increasing over the last two decades, with non-metallic minerals representing the largest share of the resource's extraction, and oil being the major contributor to the resource rents generated in Egypt. Integrated solid waste management in Egypt remains a major challenge where open dumping and burning of waste are still common practice, due to the low collection rates and treatment of waste, and projected growth of municipal solid waste generation rates of 2% annually. Yet, this sector represents good potential for circular economy activities (more specifically the industrial waste stream), where several programs and initiatives that support CE are taking place that are not necessarily framed under Circularity but have the same approach and lead to similar results.

The policy framework in Egypt supports CE activities in different forms, however, the term "Circular Economy" is rarely mentioned in the strategies, instead, strategies often refer to sustainable consumption and production. As a starting point, the Egyptian constitution addresses sustainable development in several articles; with emphasis on the value of sustainable development as a main pillar to achieve prosperity. Moreover, the Sustainable Development Strategy: Egypt's Vision for 2030 serves as the national umbrella through which the SDGs will be implemented in Egypt by all stakeholders. The sustainable development strategy (SDS) defined certain goals that are directly connected to circular economy in the solid waste sector, agriculture sector, and industrial development. The other main strategy that addresses sustainable consumption and production is Egypt's National Action Plan for Sustainable Consumption and production (SCP) that was developed under the SWITCH-MED program. The SCP National Action Plan aims at supporting the creation of sustainable communities and cities in Egypt through the promotion of sustainable consumption and production patterns and Egypt's SDS 2030. The SCP National Action Plan identified solid waste management, agriculture, water, and energy as the priority sectors.

With regards to the environmental standards and regulations, the main law that addresses environmental matters in Egypt is the Environmental Law 4 for the year 1994 amended by Law 9

/2009 and law 105/2015, and its executive regulations. The Egyptian Ministry of Environment is taking steps to further incorporate CE into national regulations; with the new waste law that addresses circular economy in waste management. This new waste law has been approved by the Egyptian Parliament in August 2020.

In terms of trade and investments between the EU and Egypt, EU's main imports of goods from Egypt are fuel and mining products, chemicals, textiles and clothing, and the main imports of services include travel and transport services. On the other hand, EU's main exports of goods to Egypt are machinery and transport equipment, chemicals, fuels and mining products, and agricultural products, while the main exports of services are business services. Around 30% of Egypt's exports are going to the European Union and similarly around 30% of the imports originate from the European Union. With regards to foreign direct investment in Egypt, petroleum sector contributes to the biggest share, yet, tourism, the agriculture and manufacturing sector are among the sectors that are targeted by foreign direct investments and were identified as sectors with high CE potential.

When speaking about existing awareness and capacities on CE in Egypt, initiatives raising national awareness on CE in Egypt are generally limited. In general, there are several nationally driven programmes/initiatives that support circular economy in Egypt. However, most of these programmes are recent and it is too early to say something about their impacts. The problem with older programmes is that they often faced implementation issues. Awareness on other CE-related topics such as green economy, sustainable consumption and production often exist (in SDS and SCP National Action Plan). On the businesses/industries level, awareness on the principles and the overarching concept of CE is gradually growing and is taking place in the entrepreneurship and start-up scene, facilitated by Initiatives such as the Start and Improve Your Business (SIYB) program led by the ILO. In relation to consumers awareness level on CE, it can be concluded that it is mostly low. Yet, consumers in Egypt generally tend to implement CE measures to extend the lifetime of their goods by applying repairing, maintenance, and efficient operation techniques (to the extent possible) without labelling it as CE measures. In terms of national capacities on CE in Egypt, as recommended by SCP national action plan, it still needs to be further developed across different sectors, given that CE has not been adopted as an integrated topic across technical and vocational education as well as higher educational programs.

Trade and investment in CE

EU member states have been the most important sources of Foreign Direct Investments (FDIs) for Egypt, where most of the FDIs were directed towards the oil sector, followed by services and construction. However, the trade of CE-related environmental goods and services has not yet been in the centre of attention between both parties. Several opportunities could be explored in the trade of CE-related goods and services such as recycling technologies for plastic and rubber waste. Also, export of post-consumer/waste products from EU to Egypt is an important trade movement. Support can thus be provided to the Egyptian Ministry of Environment in developing and enforcing a regulatory framework for the traceability of imported wastes to avoid using non-hazardous wastes as second-hand products in the black market instead of recycling them, which may cause further deterioration to the market conditions. Furthermore, cooperation with online industrial waste exchange platforms such as IWEX and Waste Marche provide a good opportunity for the exchange of non-hazardous industrial wastes. Also, CE opportunities can exist with respect to Enhanced Producer Responsibility (EPR) schemes given that it is currently forming a central element in the new waste law.

Impacts and Benefits of the CE in Egypt

In this study we have also done a forward-looking assessment analysing the impacts of implementing a (limited) set of circular economy actions between now and 2030. A macro-economic model was used to estimate the impact of implementing a set of circular economy measures in the identified priority sectors Agri-food, plastics, construction, 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. The key findings are the following (for more detail see section 3.2.3):

- **Economic benefits:**
 - A **1.0% increase of GDP** (+ €5.2 bn) compared to business as usual;

- An **improvement of the trade balance**, through a reduction in imports worth € 685 M and an increase in exports €212 M;
 - Food loss reduction across the agricultural value chain and associated investments are the largest driver of the impacts on reduced imports;
 - Positive GDP impacts are strongly driven by increases in investments.
- **Social benefits:**
 - **101,000 additional jobs** would be created compared to business as usual, which is equivalent to an increase of 0.3%;
 - The largest employment increases are found to occur in agriculture, services (largely driven by waste management), construction, and telecommunications distribution, retail and manufacturing;
 - 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.

Circular economy-related cooperation between the EU and Egypt

Policy Dialogues

In the mapping of CE-related cooperation between the EU and Egypt, CE did not play an important role in the policy dialogues between the EU and Egypt; with some exchanges addressing CE related aspects in some sectors. The policy dialogue on CE should be aligned with the common EU-Egypt objectives in this field as well as the national circumstances and priorities of the Egyptian government. The current EU-Egypt Association Agreement provides a good basis to start with for addressing CE in future policy dialogues with enhanced cooperation provisions to address common challenges. On the other hand, the Egyptian government needs to clearly identify their CE related priorities and they also need to identify the relevant stakeholders to facilitate the cooperation.

Development cooperation projects and programmes, including by the EU Member State

With regards to the development of cooperation projects and programmes between the EU and Egypt, the EU's Single Support Framework (SSF) sets priorities and the financial allocation in key strategic areas of bilateral cooperation with Egypt for the period between 2017 and 2020. Hence, the EU is supporting various development projects in Egypt through its Switch Mediterranean (SwitchMed) Programme, implemented by the UNIDO, the UN Environment Programme's Economy Division, the UN Environment Mediterranean Action Plan and its Regional Activity Centre for Sustainable Consumption and Production (SCP/RAC). This program aims at creating productive, circular, and sharing economies in the Mediterranean region. MED TEST II project funded by the SwitchMed and implemented by the Egyptian National Cleaner Production Centre (ENPCPC) aimed at Transferring Environmentally Sound Technologies (TEST) by providing direct consultancy services to industries with regards to minimisation of environmental impacts. The third phase of MED-TEST III is planned to be launched, focusing on CE in the textiles sector. Another project, implemented as part of the SwitchMed project, is the development of Green Entrepreneurship project between 2014 and 2018. Circular economy principles formed a cornerstone of the training program. Furthermore, the EBRD is currently supporting four projects in the water and sanitation sector and further support is provided by other EU donors. Clearly, even though many of these development projects relate to CE principles, these projects have not yet addressed CE as an overarching economic model. However, EU's development cooperation programmes could offer a very good opportunity for establishing cooperation on CE related programmes, with the SWITCHMED programme being uniquely placed for integrating CE into its core activities. It is important to align the development programme related to CE with Egypt's national priorities and circumstances, with the involvement of the ministry of planning and finance, together with the ministry of environment as well as the private sector. There is also a great potential of future development projects that lies in the transfer of technology and know-how for the implementation of CE-related projects.

Activities by EIB and other DFIs

The EIB and EU are currently in discussions with the Egyptian government on funding projects related to biogas generation from organic wastes such as sludge from sewage treatment plants, animal manure, agricultural waste, and wastes from dairy products industrial facilities. Additionally, the EBRD has invested over EUR 2 billion in 36 projects in Egypt, of which 15 projects representing EUR 695 million were part of the so-called Green Economy Transition mandate. Besides supporting the transition to renewable energy, last year investment areas of the EBRD covered climate-related projects of SMEs, programmes to address unemployment within the young generation and to raise their skillsets. It also happens that in some cases several European financing institutes join hands to finance projects of larger volume. For instance, the project "Improved Water and Wastewater Programme (phase I)" received an EU grant of EUR 34 million and additional funding was jointly provided by the KfW, EIB and AFD. Yet, in relation to CE-financing, CE-financing has not been a central pillar of investment cooperation and there are still further opportunities that could be exploited in the solid waste management sector, the building and construction sector and the textile industry. Also, the support of awareness raising efforts on CE in the public and private sector, as well as mainstreaming CE among key players in the Egyptian Government (such as Ministries of Environment, Finance and Planning) is necessary. Furthermore, providing support to the Egyptian Ministry of Environment to develop guidelines that set criteria of evaluating projects that contribute to achieving CE can be considered as one of the opportunities. Likewise, financing institutions also could receive support by building their capacities in establishing CE -related investment funds and programmes.

EU companies with CE activities and footprints in Egypt

Several EU companies in the Egyptian market follow international standards and guidelines that tend to implement CE measures and achieve CE objectives; however, these measures are not categorized as CE measures. For instance, LafargeHolcim and Heidelberg cement producers in Egypt, adopt and promote CE practices through the use of biomass residues and refuse derived fuel as partial substitutes to fossil fuels in the clinker production process. There are several entities that can provide support and facilitate cooperation between Egypt and EU companies on CE matters such as the Environmental Compliance Office of the Federation of Egyptian Industries, the Egyptian National Cleaner Production Centre and Confederation of Egyptian European Business Associations (CEEBA). However, further awareness raising among such industrial facilities in Egypt on both CE and green financing opportunities is necessary beforehand.

Research and technical cooperation

The foundation for cooperation in research, science and technology is set by the "EC-Egypt Agreement for Scientific and Technological Cooperation, Road Map", which was signed in 2005 and has been in implementation from 2008 onwards. Over 71 projects were conducted in partnership with EU institutions and a total of EUR 6.6 million were granted to the participants of the projects with "application-oriented" research projects. Development and Innovation programme an additional EUR 6 million were given to an EU/Egypt Innovation fund. However, CE does not yet form an explicit part of joint research undertakings.

Research on CE related topics is still not well introduced among Egyptian universities and research centres. Thus, universities can play an important role in the research and the technical cooperation on CE between Egypt and the EU, since collaboration between industries and researchers can assist in identifying and validating CE-relating opportunities which can be further exchanged between the 2 parties. There is also a need for further technical cooperation and building of technical on the adoption and implementation of CE measures. The EU can provide support to the local research on CE related topics in such institutions, with a particular focus on advanced circular economy measures, where Horizon Europe's mission areas are uniquely placed to cater to the most pressing needs of the Egyptian transition to CE.

Snapshot of Recommendations

Transitioning to circular economy in Egypt shall be foreseen as a tool to create new job opportunities, develop industries, address waste management issues, and foster sustainable economic growth.

There are several nationally driven financial programmes and initiatives that support circular economy in industry, waste, tourism, and agriculture sectors. Such programmes/initiatives could be used as a starting point to further scale up CE related measures in these sectors.

As a starting point, raising awareness and building capacities on CE among private and public sectors is a necessary step to further advance CE cooperation between Egypt and EU. Such awareness shall include transfer of technical knowledge on CE measures, support in establishing CE business models and successful business cases in CE, further support to MSMEs, awareness and capacity building among financing institutions in Egypt and awareness among relevant stakeholders. Involvement with universities and technical institutions will also foster collaboration on research activities related to circular economy.

There are also several development cooperation programmes that could facilitate the promotion of CE in Egypt, given their long-standing history in Egypt and successful results in achieving tangible results in different topics related to resources efficiency, such as those implemented by UNIDO (Industrial Energy Efficiency program) and UNEP (SWITCH-MED Programme) and the Centre for Environment and Development for the Arab Region and Europe (CEDARE). The Confederation of Egyptian European Business Associations (CEEBA) can also play an important role in exploring business to business opportunities related to CE in the policy dialogues.

Another important recommendation is the creation of a focal point (or small unit) within the Egyptian administration, dedicated to develop sustainable goals and as such also the circular economy agenda, hand in hand with the delegation of the EU.

It is also recommended to implement pilot cases on CE-related projects, as cooperation should not be only supporting the development of frameworks and strategies. Also, it is important to ensure the sustainability of the outcomes of the CE cooperation projects, by creating an exit strategy that sustains the outcomes of the project after the end of the programme's timeline. It is also important to establish monitoring and evidence collection system for the economic, social and environmental outcomes of these pilot cases for potential upscaling and advocacy.

The report also provides sector-specific recommendations to develop EU-Egypt cooperation in the circular transition of key economic sectors identified (agriculture, industry sectors such as textiles, plastics, chemicals and agri-food, waste, building and housing, and the tourism sector)

1 Introduction

1.1 Scope and methodology of the 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 Egypt. It explains the potential economic, environmental and social impact of the transition to the circular economy in Egypt 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 Egypt, 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.

1.1.2 Methodology

The report has been prepared by Trinomics B.V., Adelphi and Cambridge Econometrics in close cooperation with an Egyptian expert (Marwa Machmoud), who has contributed local knowledge to the analysis across all sections of the report. In addition, the EU delegation in Egypt has been consulted. Desk

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](#)

research has been the basis for Chapter 1, 2 and 4. In addition, several international and national datasets have been analysed to be able to understand the status of the circular economy in Egypt (Chapter 2). Interviews with 14 relevant circular economy stakeholders (see Annex 1) have served to complement the analysis presented in this report, particularly in the chapters 2, 4 and 5.

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.

1.1.3 Reading guide

This report has been structured as follows:

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

1.2 Egypt at a glance

Egypt is located in northeast Africa and with its estimated population of just over 100 million people, it is the 3rd largest country in Africa in terms of population, and it is also the 3rd largest economy in Africa based on GDP (\$300 billion in nominal figures but in GDP per capita Egypt is only ranked no. 13 in Africa). In the 2018th edition of the human development index, Egypt ranked 9th within the African continent (with an HDI of 0,700) and it ranks 6th when it comes to Africa trade exports, whereas the EU accounts for almost a third of Egypt's exports and also a third of Egypt's imports originate from the EU. Overall, Egypt saw its trade deficit growing since 2004, reaching \$42 billion in 2019.

Egypt has seen positive developments over the last few decades, as reflected in its human development index, which grew from 0.546 in 1990 to 0.700 in 2018. And more recently efforts have been made to achieve macro-economic stabilisation (inflation reduced from more than 20% in 2018 to less than 10% in 2020) and the business climate improved slightly. These changes have helped to reduce the debt-to-GDP ratio and replenish foreign reserves. However, the country is facing significant political and societal challenges. Egypt has a youth unemployment rate of 33%, a structural housing deficit of more than 3 million units, and a third of the population (33%) lives below the poverty line (< \$1.45 a day) in 2018 - a figure that was at less than 17% in 2000.⁷

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.

⁷ Central Agency for Public Mobilization and Statistics of Egypt

There have been several economic reforms during the past decades that aimed at increasing the foreign investments and including several incentives to the private sector. The government of Egypt has also implemented a wave of macro-economic and structural reforms over the past 5 years that helped to stabilize the economy and sustain growth. These reforms included reducing subsidies on energy and fossil fuels, liberalising the exchange rate, reforming the industrial licensing regime and taxes reforms. This can be demonstrated in the GDP that has increased to 5.6% by the end of the financial year of 2019; compared to that of 2018 which was 5.3%, coupled with decrease in the unemployment rate to 7.5% in 2019 compared to 9.9% in 2018. However, the social conditions have not improved compared to the macroeconomic improvements, due to the very high inflation rates between years 2016 and 2018 as a result of currency floatation and average wages growth rates falling below the inflation rates; with the share of population living below poverty line increasing to 32.5% in 2018 compared to 27.8% in 2015 (mostly in upper Egypt). In order to mitigate this effect, the government has been designing and scaling up social safety programmes, and the government has been receiving support from organizations such as the World Bank for the implementation of such programs.

Due to Covid-19, the government launched a one-time of cash payment to irregular workers and has introduced several measures to reduce the impact (such as wage and pension increases, introduce more e-payments, revision of tax exemption thresholds, etc). Notwithstanding the pandemic, new reforms into the direction of a strong, private sector-led economic transformation are announced (with the aim to lift non-tariff barriers, fostering a level playing field (between public and private actors) but also to increase jobs and reduce poverty.

2 Status of the circular economy in Egypt

The government of Egypt is showing some commitment towards an inclusive, sustainably developed economy, which can be demonstrated in several regulations, policies and strategies that are adopted by the country.

There are initiatives and strategies that aim to (indirectly) achieve circular economy objectives in different sectors of the economy, such as waste, industry (textiles, plastics, industrial waste exchange), tourism, agriculture, and food production. However, given the political and socio-economic situation in Egypt, it is not easy to find enough interest (public and private) in the enforcement of CE. The first objective of the Egyptian government is to strengthen political and socio-economic stability. Since 2016, Egypt is focusing on economic reforms to strengthen growth, to reduce unemployment (not evident with an annual population growth rate of more than 2%, reaching 100 million habitants), to increase the exchange reserves (by stopping the fixed exchange rate) and to reduce the public debt (the budget deficit was above 10% of GDP, one of the highest in the region). From an environmental AND economic point of view, water resources are priority number one. This is especially the case as water supply from the Nile - which counts for more than 95% of the water resources in Egypt due to very low precipitation levels - is slowly decreasing (even not considering the development of the Grand Ethiopian Renaissance Dam). As such, the reuse of water (by renewable ground water extraction, wastewater reuse and agriculture drainage reuse) - already in use since more than 20 years - will even become more important. Another critical sector is the waste sector. According to the Central Agency for Public Mobilization and Statistics (CAPMAS), about 45% of the households garbage is dumped onto the street (but informally collected), while 55% is collected by private companies and garbage collectors (2018 figures). The in 2017 installed garbage collection fees (to be imposed across Egypt's governorates) should increase the recycling rate.

This chapter is split up in 4 sections. Section **Error! Reference source not found.** gives an overview on the circular economy trends in Egypt in different life cycle stages (resource extraction, manufacturing and services, and end of life stage), with a focus on some sectors that have been identified as priority sectors by the government in the national strategies and action plans. The next section looks at circular economy across different strategies and policies that are not necessarily called "circular economy" measures but have similar approaches (cf. section **Error! Reference source not found.** Section 2.3 then describes the Trade and investments in the circular economy in Egypt. Finally, section 2.4 provides an overview on the existing awareness and capacities on circular economy in Egypt and identifies the education and skills gap for integrating sustainability and circularity aspects into Egypt's educational and vocational training development agenda.

More information on these sections can be found in Annex 2.

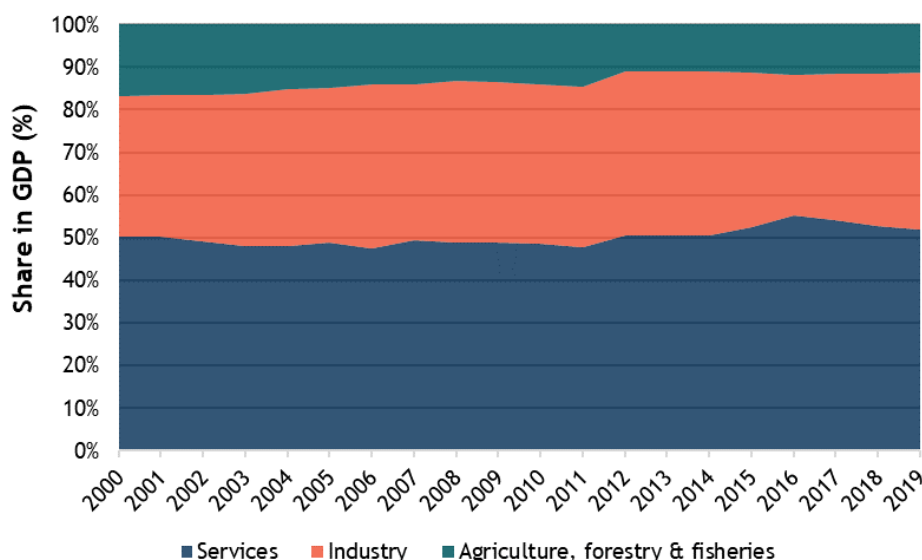
2.1 Economic analysis of CE trends in Egypt

2.1.1 Economic structure

Over the past two decades, the Egyptian economy has slowly changed, with decreasing contribution of agriculture and fisheries sector to the GDP and increasing contribution from the services sector. The share of industry has remained relatively constant, accounting for about a third of the value created in the economy (Figure 2-1). The contribution of the services sector on the other hand has been steadily increasing, from around 50% in 2000 to 56% in 2019, which can be mainly attributed to the increase in

GDP from the tourism sector, whereas the share of agriculture & fishing has been declining during the same period from 17% in 2000 to approximately 11.4% in 2019.

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



Source: World Bank - World Development Indicators.

2.1.2 Circular economy-related trends by lifecycle stage

In the following sections, we are discussing the circular economy trends in Egypt from a lifecycle perspective, as the circular economy affects the activities across the value chain. The circular economy is broader than solely resource efficiency or waste policy, it is actually a radically different model for structuring the *entire* economy.⁸ As such, the shift to a circular economy which is '*restorative and regenerative by design*'⁹, requires a far-reaching transformation of the economy, affecting entire supply chains, from resource extraction, through production and eventually waste treatment after a product's useful life. For this reason, the lifecycle perspective is a very useful angle to study the circular economy, as it does look at all the lifecycle stages of products and pays attention to the consumption phase. The latter aspect is key, since changing consumption patterns and models can make a very important contribution to a shift to a (more) circular economy. Because the lifecycle perspective is a central feature of circular economy thinking, we have also structured this chapter along these lines, looking at the following aspects of the value chain:

- Resource extraction;
- Manufacturing and services (mainly focusing on the production phase);
- Trends in consumption:
 - On a natural resource level;
 - On a product level/ from the consumer perspective.
- Trends in the end-of-life stage: waste generation and management.

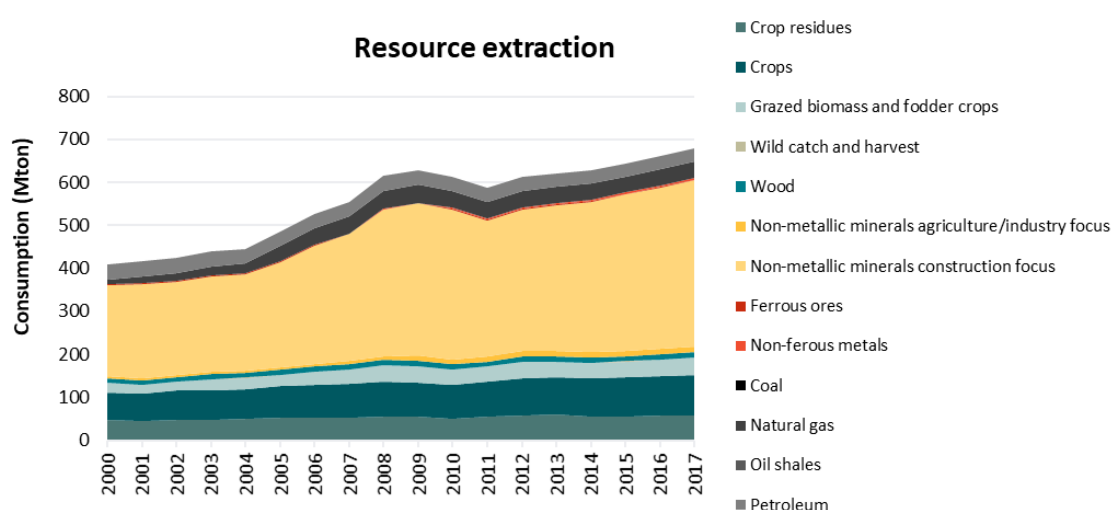
⁸ <https://www.ellenmacarthurfoundation.org/circular-economy/concept>

⁹ Towards a Circular Economy: Business Rationale for an Accelerated Transition, Ellen Macarthur foundation.

2.1.3 Trends in resource extraction

When looking at the first stage of the value chain, the phase of resource extraction, we see that Egypt's resource extraction has been steadily increasing over the last two decades. The largest part of the resource extraction in Egypt relates to the extraction of non-metallic minerals (Figure 2-2), with construction-related minerals (e.g. limestone) accounting for the largest part of the production. In 2017, non-metallic minerals accounted for 52% of the country's resource extraction. Another important mineral product is phosphate rock, which is used mostly to produce mineral fertilisers. Most of these non-metallic minerals are used for domestic consumption, with a net export of only 3% of the total extraction. This fact can largely be explained by the enormous use of concrete in Egypt (see section 2.2.5). Egypt is also producing natural gas and more recently oil. Although Egypt has been a net exporter of fossil resources, since 2015, the country has become a net importer, due to a modest decline in production at the backdrop of a steadily growing energy demand.

Figure 2-2 Resource extraction in Egypt by type for the period 2000-2017



Source: UN SDG Indicator 12.2 Domestic Resource Extraction

2.1.4 Circular economy in manufacturing and services

The following tables provide an overview on the economic contribution of few selected sectors of the economy in Egypt that have been thoroughly described in the following subsections. 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 CE in these sectors;
- Prioritization of these sectors in Egypt's SDS 2030, National SCP action plan and sustainable and green growth strategy for Egypt;
- Interlinking with the priorities of the EU's CE action plan;
- Identification of opportunities in these sectors that contribute to the achievement of CE measures.

Table 2-1 Economic contribution of different sectors of the economy in Egypt

Sector		Percentage of Labour Force		Share from the total GDP	
Industry	Textiles	26.59%	8% from the industry labour	32.6%	3%
	Plastics		10% from the industry labor		3%
	Food Manufacturing		15% from the industry labor		4.7%
Tourism		9.5%		11.9 ¹⁰ %	
Agriculture sector		27.5%		11.4%	

The remaining sectors that are majorly contributing to the national GDP in Egypt are extraction activities representing around 12% (crude oil, natural gas and other extractions), construction sector representing around 6%, transportation and storage representing around 5%, wholesale and retail representing around 14%, real estate activities representing around 10% and education, health and personal services representing around 7%.

Industry

The industrial sector in Egypt is one of the cornerstones of the Egyptian economy; contributing to around 33% of the GDP and is a major consumer of energy in Egypt.

Based on previous studies and surveys carried out by national and international organizations, it was estimated that there is a potential for energy savings in Egypt reaching about 23%. Of this 23%, the industrial sector holds up to 40% of the total energy savings potential using commercially available advanced technologies in Egypt that improve their energy efficiency in addition to improving their operational performance measures.

Indeed, Egypt is among the most energy intensive economies in the MENA and globally twice as high as Morocco and Tunisia and four times countries like Japan and Germany. On the sectoral level, most industrial processes' consumption is higher than international practices. Innovation in this arena and resource utilisation would improve costs and competitiveness of Egyptian enterprise.

In terms of GHG emissions on the national level, the industrial sector is responsible for 12.5% of the total GHG emissions in Egypt, where the minerals industry is the major contributor to GHG emissions in the industrial sector. The link between GHG emissions and CE activities cannot be made yet as this breakdown is not available yet for Egypt.

The total GHGs emissions from the industrial sector have increased from 27.2 million tCO₂e in year 2005 to 40.67 million tCO₂e in year 2015 due to the following factors:

1. The growth of the mineral industry in Egypt at a steady rate, especially the cement industry;
2. The chemicals industry has also been growing, specifically the fertilizers industry and the petrochemical industries (e.g. Methanol, ethylene and polyethylene, Urea, styrene, polystyrene, polypropylene, PVC, LLDPE, HDPE, PET)¹¹ - plastics are discussed in a separate section below;
3. The growth of the iron steel industry operated by the private sector, while on the other hand, iron and steel plants owned by the public sector were facing some challenges, while the steel industries operated by the private sector were thriving;

¹⁰ Source: World Travel & Tourism Council (WTTC) report in 2019. The value refers to real contribution of the tourism sector to the GDP, since ministry of planning reports value accounts for GDP from for hotels and restaurants only which is reported to be around 2% in 2018.

¹¹ Source: Presentation by the Egyptian Petrochemicals Holding Company (<http://echem-eg.com/wp-content/uploads/2019/04/Petrochemicals-industry-current-threats-and-future-plans-.pdf>)

4. Phase out of the ozone depleting substances from the early 2000s, accompanied by high growth rate of emissions from substitutes for ozone depleting substances between 2005 and 2015.

The development of the industrial sector is guided by the Sustainable development strategy SDS 2030 in addition to the Industry and Trade Development Strategy 2016-2020. Both initiatives have a set of targets and key performance indicators for the manufacturing sector. There are also several initiatives and programmes that are taking place to develop the industrial's sectors towards circular economy.

Textiles

Textiles industry is one of the most important industries in Egypt, as it plays a central role in the Egyptian economy. It contributes to 3% of the Egyptian GDP, 30% of industrial work force and represents around 10% of the country's exports.

This sector has been negatively influenced over the last 2 decades with regulatory changes in addition to the international competition due to lower costs overseas, which made Egyptian producers unable to compete with other markets (e.g. China) and caused a strong decline in the sales of domestic textile and RMG.

Accordingly, the government is planning to flourish one of its important industries again. The industry and Trade Development Strategy 2016-2020 is planning to establish new industrial city clusters allocated for the textile sector solely; with the aim of developing the textile industry and attracting foreign investments. One of the projects identified by the strategy (project number 1.5: Enhancing the Industrial Competitiveness Project) involves the "development of a specialized program for the enhancement of production methods and knowledge transfer that increases production efficiency, reduces the waste of resources and increases the added value in several sectors that include textile industries".

The government is also setting a vision for the cotton sector that integrates agricultural, commercial, and industrial dimensions of the industry, and focuses on maximizing the utilization of the available resources.

The textiles sector was also being targeted by the MED-TEST II project, and the MED-TEST III project (planned to be launched in Egypt) will mainly focus on applying circular economy in the textiles sector value chain as a result of its strategic importance and the direction of government towards its revival. Hence, this sector will play an important role in circular economy in Egypt.

Plastics

Egypt produces around 1.1 million tons of plastics raw materials per year, while local plastic companies consume around 2.2 million tons of plastics raw materials per year. Consequently, Egypt imports a wide range of polymers that are used as raw materials and additives for plastic industry (e.g. LDPE, PET, ABS). The national petrochemicals companies produced around 47% of the local plastic requirements of raw material in 2016; where 28% of the requirements of local plastic industries from raw material are covered by the local petrochemical companies, and the remaining portion is exported. There are eight petrochemical plants in Egypt that produce plastic raw materials. Polyethylene, polyvinyl chloride suspension, PET, and thermoset plastics are the most common locally manufactured products, while propylene continues to be imported.

When it comes to plastic recycling industry, around 290,000 to 300,000 tons/year of local plastic waste is sorted for plastic recycling process, and most of the recycled plastic material is distributed among local plastic recycling facilities, with minor exports of recycled plastic compounds (e.g. BARIQ company in Egypt producing recycled PET). The amount of recycled plastic waste represents around 11% from the total produced plastic wastes in Egypt.

This sector faces several constraints and bottlenecks that challenge its sustainable production:

- Access to raw material
- Access to markets and marketing services:
- Administrative obstacles and work environment represented in bureaucracy and complexities in the process of approval of industrial licenses in municipalities. However, this problem has been tackled by changes in the industrial licensing law that expedites the licensing process to encourage further investment in the industrial sector;
- Access to equipment, skilled labour and quality testing centres, and obtaining finance to invest in and further upgrade the sector.

The development of the plastics sub-sector to improve its sustainable production and circularity has been addressed in the Industry and Trade Development Strategy 2016-2020. However, the major challenge that could face this sector (in relation to circular economy) is the informal waste separation and collection of dry valuable recyclables that include plastic that could have otherwise been used in plastics recycling industry. Furthermore, technical knowledge related to applying circular economy measures in the plastics sector need to be transferred to Egypt, where opportunities relevant to the national conditions and circumstances could be identified and further explored.

Food Processing and Manufacturing

Food processing and manufacturing industry is the second largest manufacturing sector in Egypt after petroleum refinery industry; accounting for 15% from the total manufacturing industry. This sector has been growing continuously due to the increase in production for national consumption and exports. Egypt also imports food ingredients from the United states and the European Union, with imports reaching 4 billion USD in 2017.

This sector is a priority sector for the government in the Industry and Trade Development Strategy 2016 - 2020, and it shows potential for resource efficiency (water, materials, and energy) according to the SWITCH MED (MED-TEST II project). Participating companies from the food sector in MED-TEST II project identified 141 measures for resources efficiency measures, where 100 of them have been accepted. These measures have a payback of short to medium term, where such measures resulted in water, materials, and energy savings.

This sector shows a good potential for cooperation in circular economy as identified through the interviews with relevant stakeholders. Agri-food waste has a huge potential to be used as raw material for the production of several products that are currently being imported in Egypt such as pectin which can be manufactured from oranges peels and Egypt is among the top 5 countries worldwide in the exports of oranges. However, agri-food industries need technological support and capacity building in identifying and implementing opportunities that support the CE measures.

Tourism

The Egyptian Ministry of Tourism has been putting a lot of its efforts to develop its sustainable development agenda; in support of the national sustainable development goals of the SDS 2030. It established the Green Tourism Unit to help build the institutional capacity within the Ministry, co-invest with hotels in energy efficiency and renewable energy projects and set the guidelines for the new development/constructions in hotels sector.

The Egyptian Ministry of Tourism has also launched its Reform Program in 2018 that aims to achieve sustainable tourism through implementing structural reforms that strengthen the sector's competitiveness in line with international standards. The ministry aims to redefine partnership with intergovernmental organizations and foreign development agencies to work towards achieving the Sustainable Development Goals. In addition, the global tourism trends pillar involves branding Egypt as a responsible destination with recognized and environmental and social standards.

Additionally, the Green Star Hotel (certification and capacity building) program has been established in 2012 as a project of major Egyptian and German stakeholders, with the aim of raising awareness on green tourism and rewarding environmentally friendly practices by adhering to environmental and social prerequisites. It is managed by the Egyptian Hotel Association (EHA) under the patronage of the Egyptian Ministry of Tourism. It was developed to encourage local hotels to adhere to international environmental and social standards to increase their competitiveness in green hospitality while also reducing carbon footprint as a by-product. Such standards cover measures that include energy efficiency, renewable energy, water savings, solid waste management and other standards that are related to the hotel operation. However, there is still potential in expanding their network to complement more elements value chain of the tourism sector such as transportation, tour operators, and archaeological sites, and the GSH are interested to grow in such directions. As of now, there are 80 hotels in Egypt with approximately 20,000 rooms in 15 destinations over Egypt are Green star certified.

This certification enables these hotels to be internationally recognized for raising their environmental performance and social standards while reducing their operational costs. There is a very good potential to enhance circular economy practices in the GSH program, with a particular focus on energy efficiency measures and renewable energy (e.g. solar water heaters and electricity generation using solar cells), in addition to implementing CE measures in the construction/expansion of hotels/resorts.

Another highlight related to green tourism is “Green Sharm El Sheikh” project, which aims at transforming Sharm El Sheikh city into a “model integrated and ecologically sustainable tourism city of national and international importance through the adoption of low-carbon technologies, good waste management practices and further enhanced protection of its natural capital basis”¹².

The fund received for this project is directed for technical assistance. However, further support (financial) is required for the implementation of the action plan that will be developed. This could also represent an opportunity for CE to be integrated in Green Sharm El Sheikh Project.

¹² https://www.thegef.org/sites/default/files/web-documents/10117_PIF.pdf

Agriculture Sector

The agricultural sector in Egypt plays a vital role in the Egyptian Economy; where it provides livelihood for around 55% of the population and has a GDP contribution of around 11%. Nevertheless, it consumes around 4.4% from total electricity generated in Egypt. Despite its broad production of crops, vegetables and fruits, the country did not achieve food self-sufficiency to meet its consumption demands, and this problem will only grow bigger due to the challenges facing this sector that include diminishing agriculture potential and soil quality, water scarcity problems, climate change, deficit on its food balance and rising imports bills.

The main challenges facing this sector are as follows:

- Inefficient and unsustainable irrigation practices;
- Water scarcity problems;
- Inefficient energy practices in operating the irrigation system (e.g. pumping stations);
- Improper management of agricultural wastes (e.g. burning of agricultural residues);
- Absence of an integrated development approach to the agriculture sector;
- Degradation of soil quality and agricultural products as a result of excessive use of synthetic fertilizers and pesticides;
- High vulnerability of the sector to the impacts of climate change that will be represented in reduction in the yield of some crops and change of agricultural areas in addition to the spread of fungal plant diseases, particularly the northern areas bordering the Mediterranean coast¹³;
- Food losses and waste encountered during the post-harvest handling due to the improper means of transport, storage and crops processing, affecting the food quality and losses in the market.

This sector is a priority sector to the Egyptian Government, and it has been strongly addressed in several strategies and action plans, given its contribution in the Egyptian economy and its vital role in achieving food security and its effect on the food industry which is one of the most important industries in Egypt. Also, given that it consumes large amounts of water, minimization of water consumption in the agriculture sector is a top priority to the government, as a result of water scarcity problems in Egypt due to several factors that include climate change. Currently, the utilization of treated wastewater in Egypt for irrigation purposes is regulated by the law (Code 501/2015 for Wastewater Reuse and Law 84/1982 and subsequent bylaws), with different irrigation uses depending on the degree of wastewater treatment. The approximate amount of treated wastewater used in irrigation is 300 million m³ per year.

Moreover, food losses and waste from the agriculture sector have also been addressed in SDS 2030. However, even if strategies and action plans in the agriculture sector are not framed as circular economy measures / actions but rather as sustainable consumption and production measures and practices, they however follow approaches that are interlinking with circular economy concepts.

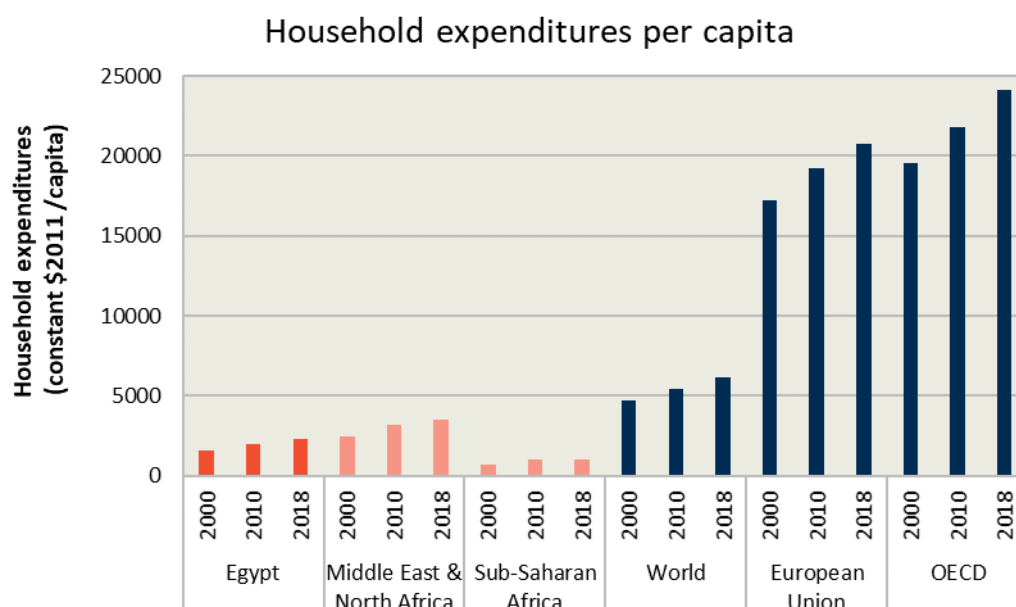
2.1.5 Trends in consumption patterns

The overall consumption levels have been steadily growing in Egypt over the last two decades. During this period, per capita household expenditures increased with 48% (

¹³ Source: Egypt's National Strategy for Adaptation to Climate Change and Disaster Risk Reduction

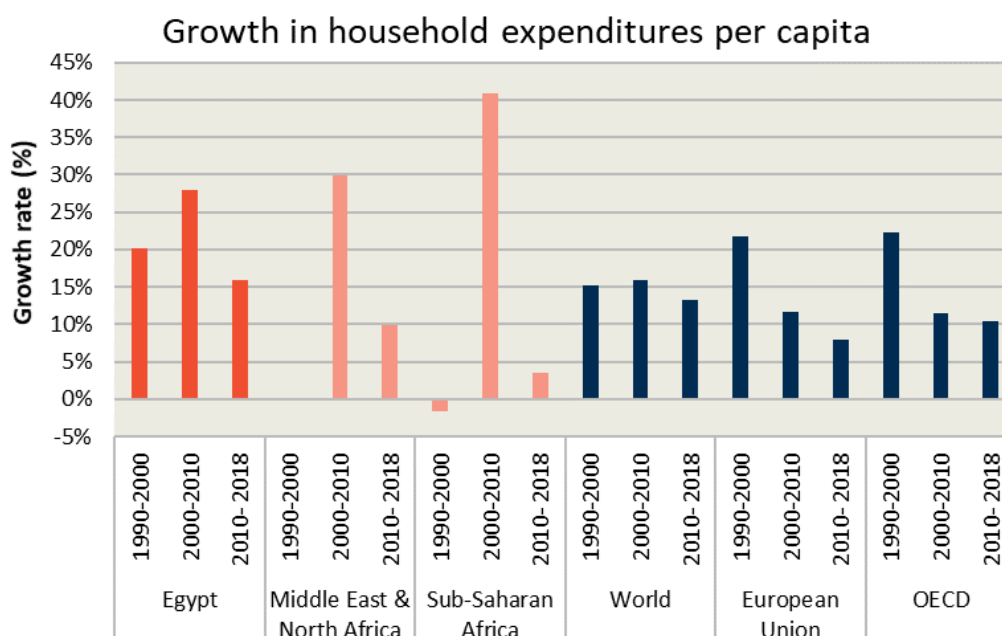
Figure 2-33), whereas the GDP per capita grew by 75%. The per capita household expenditures are among the highest in the North African region, but still around 40% of the world average, but this is without correction for purchasing power. On the other hand, the growth rate of per capita household expenditures grew faster in Egypt than the world average (see Figure 2-44).

Figure 2-3 Household expenditures for Egypt compared to regional averages



Source: World Bank - World Development Indicators - Households and NPISHs Final consumption expenditure, PPP (constant 2011 international \$) per capita.

Figure 2-4 Growth in household expenditures for Egypt compared to regional averages

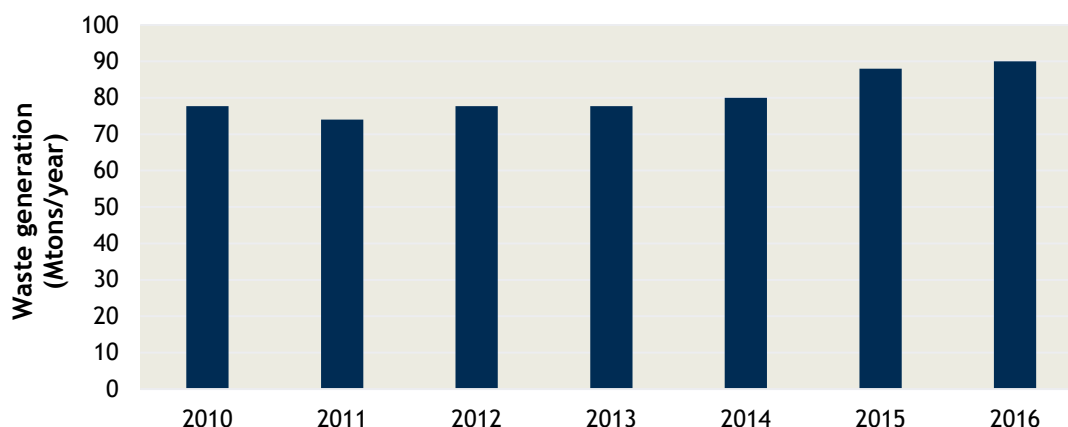


Source: World Bank - World Development Indicators - Households and NPISHs Final consumption expenditure, PPP (constant 2011 international \$) per capita.

2.1.6 The end-of-life stage: reverse logistics, reuse, waste generation and management

Owing to its big and growing population, Egypt's solid waste generation rate reached around 90 million tonnes in 2016¹⁴; where municipal solid waste and agricultural wastes are dominant. The following chart illustrates the increase in solid waste generation rates over the years.

Figure 2-5 Solid waste generation in Egypt



Source: Status of Environment reports (years 2010 till 2016), Egyptian Environmental Affairs Agency, Ministry of Environment

Waste generation rates in Egypt are greatly affected by the living standard of its people, where waste generation rate per capita is estimated to be 1.07 kg/capita in urban areas, while it reaches 0.5 kg/capita in rural areas¹⁵. As demonstrated from the below table, integrated solid waste management in Egypt remains a major challenge; where open dumping and burning of wastes are still common practice, due to the very low collection rates and treatment of wastes (50- 65% in urban areas and 0 - 30% in rural areas¹⁶) and the remaining wastes accumulate in and around residential and commercial areas and are often dumped into rivers and abandoned canals. This of course has led to adverse impacts on the public health and led to environmental degradation and loss of resources. It also has negative effect on tourism, trade, and the attractiveness of Egypt as a place to do business.

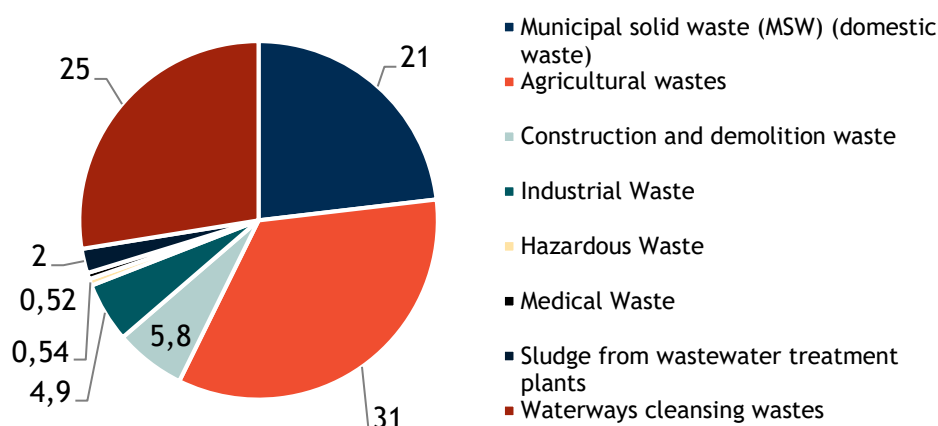
Such problems are also attributed to the unclear scattered responsibilities between governmental bodies (Ministry of Environment, Ministry of Urban Planning, Ministry of Housing, Municipalities...etc), inadequate legal and missing overall policy frameworks, outdated practices, scavenging practices of the informal waste collectors “Zabbaleen”, and lack of dedicated funding made it difficult to manage the solid waste sector in Egypt in a circular approach.

¹⁴ Source: Status of Environment report, year 2016, Egyptian Environmental Affairs Agency, Ministry of Environment.

¹⁵ Source: SWEEP-Net report, Egypt, 2014

¹⁶ Source: SWEEP-Net report, Egypt, 2014

Figure 2-6 Waste generation in Egypt by type of waste

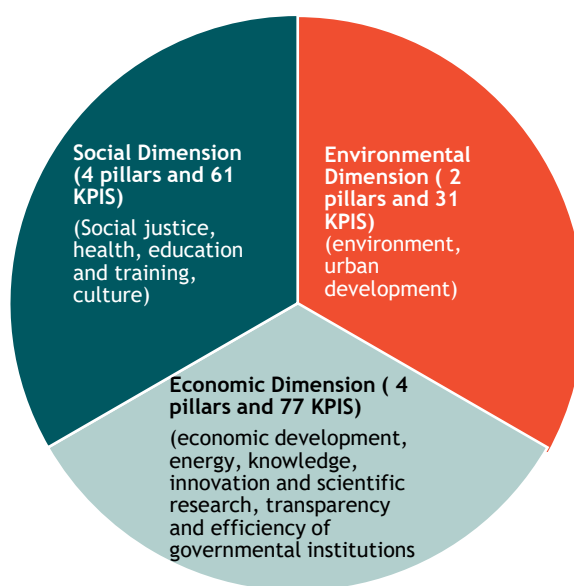


Source: Status of Environment reports (year 2016), Egyptian Environmental Affairs Agency, Ministry of Environment

2.2 Policy framework supporting circular economy activities

Before the launch of the Sustainable Development Goals (SDGs) in September 2015, Egypt committed itself towards achieving sustainable development through the Egyptian Constitution, which was drafted and amended in 2014. The Constitution is highly aligned with the philosophy, principles, and goals of sustainable development and of 2030 global agenda and covers the 3 main dimensions of sustainable development. It addresses sustainable development in several articles; emphasizing the value of sustainable development as a main pillar to achieve prosperity. It also refers to sustainable development as a right and obligation for current and future generations.

Moreover, Egypt showed higher level of commitment towards achieving the SDGs by launching its Sustainable Development Strategy (SDS): Egypt Vision 2030" in March 2016, in line with SDGs. Egypt's SDS is based on the economic, social and environmental dimensions of sustainable development through 10 main pillars that are broadly covering the SDGs. It serves as the national umbrella through which the SDGs will be implemented in Egypt by all stakeholders, including the government, private sector and civil society organizations. It is the overarching national strategy, through which sectoral strategies are developed in consistency with. The strategy is comprised of 45 strategic goals that cover each of the three dimensions of sustainable development: economic, environmental and social dimensions. Each dimension is sub-divided into pillars and KPIs as demonstrated in the below figure.

Figure 2-7 Dimensions and Pillars of Egypt's SDS 2030

The economic pillar in the SDS promotes circular economy in the industrial sector through the introduction of the concept of the green economy to increase its competitiveness in the international markets and preserve the environment, rationalize the use of energy, promote the use of alternative energy, reduce the unit cost of production and optimize resources consumption. Additionally, the environmental pillar in the SDS aims at integrating the environment dimension in all economic sectors to preserve natural resources and support their efficient use and investment, which also contributes to circular economy. For example, solid waste management objectives were developed crosscutting across several sectors, such as reducing the amounts of wastes being generated from the energy sector, maximizing the use of agricultural wastes, in addition to reusing and recycling industrial waste to maximize the benefit from these wastes in the industrial sector.

The other main strategy that addresses sustainable consumption and production is Egypt's National Action Plan for Sustainable Consumption and production (SCP)¹⁷ that was developed under the SWITCH-MED program. This action plan builds upon national strategies and policies that integrates the efforts of the Egyptian government to promote green policies in 4 priority sectors (energy, municipal solid waste, agriculture and water). It intends to support the creation of sustainable communities and cities in Egypt through the promotion of sustainable consumption and production patterns.

Lately, a unified law to regulate the management of all types of wastes has been approved by the Egyptian parliament in August 2020. This new waste law aims to ensure the sustainability of the necessary financial resources for the integrated waste management and sets incentives for the investment in the waste management sector. Most importantly, the new waste law addresses circular economy in a whole separate chapter.

There are several initiatives and nationally driven actions that are directly or indirectly related to circular economy. However, many of these programmes are rather recent (developed over the last 2 to 3 years)

¹⁷ The SCP national action plan is guided by Egypt's green economy strategy and Egypt's SDS 2030

and as such it is too early to investigate their impacts. The problem with older programmes is that they often lack implementation. A long list of examples for the waste, agriculture and tourism and industries are given in Annex 3.

Generally, circular economy has not been addressed separately as a topic in the national policies and strategies. However, the concept has been embedded in the sustainable development strategy of Egypt SDS 2030, sustainable and green growth strategy (as a part of Egypt's Sustainable competitiveness strategy), the National Solid Waste Management Program (NSWMP) and the national sustainable consumption and production action plan. These strategies can provide a pathway for circular economy to further advance in the national context, in a way that creates new job opportunities for lower-income communities especially in rural areas. These strategies can also provide support to the Micro, Small and Medium Enterprises (MSMEs) which are currently being strongly supported by the government. Legislative reforms took place to support MSMEs, such as law 176 of 2018 which improves access of MSMEs to financing options and provides legal framework for financial leasing and factoring activities¹⁸. Yet, such strategies alone are not enough to support the transition towards CE in Egypt since CE measures/business models are not in place yet in Egypt (but they could act as a starting point for the development of a framework strategy on circular economy with clear priorities, an implementation plan and investment plan).

2.3 Trade and investments in the circular economy in Egypt

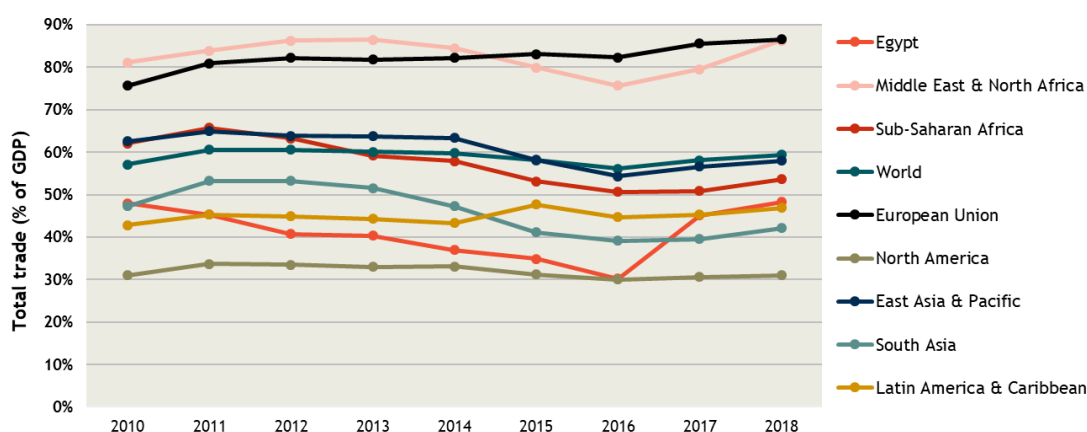
In general, in terms of goods and services, EU's main imports of goods from Egypt are fuel and mining products, chemicals, textiles and clothing, while the main imports of services consist of travel services and transport. On the other hand, EU's main exports of goods to Egypt are machinery and transport equipment, chemicals, fuels and mining products, and agricultural products, while the main exports of services are business services.

This section looks at the level of trade and foreign investments occurring in Egypt and the factors that influence trade and investment. An overview on the trend trade and investment is given below. The economic, financial and political factors that affect the level of trade and foreign investments will be investigated in Annex 2.

The relative level of trade of Egypt with other countries is comparable with that of the EU (Figure 2-88). The volatility of the Egyptian Pound has negatively affected the trade volume in 2015 and 2016, but since then trade volumes have recovered to a level comparable to that of the EU. It should be noted though, that the importance of trade in the Egyptian economy is lower than it is on average in the MENA region. However, these results are probably biased by some countries in the Middle East that are exporting vast amounts of oil and gas, thereby increasing the total share of trade in GDP. Although resource exports are important for the Egyptian economy, the overall volume of exports is still relatively low. The total value of import value is 175% larger than the total export value and as a consequence Egypt had an annual trade deficit of 26-52 \$US bn in the period 2010-2018.

¹⁸ <https://www.mondaq.com/leasing/855804/egypt39s-new-financial-leasing-law>

Figure 2-8 Share of total trade (Imports+exports) in GDP (%) in Egypt compared to regional averages for the period 2010-2018.



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

Around 30% of Egypt's exports are going to the European Union and similarly around 30% of the imports originate from the European Union, and this share has remained relatively stable over the last decade.¹⁹ Conversely, in 2016 Egypt accounted for approximately 0.7% of the total Extra-EU trade of the EU, for 1% of the extra-EU exports and 0.4% of the EU imports from outside the EU. In total around 12% of the EU exports go to Africa and around 10% of this goes to Egypt.²⁰ When looking at the EU's imports from outside the EU, we see that Africa accounts for 5% of those imports, of which in turn 5% comes from Egypt.

Trade in environmental goods and services

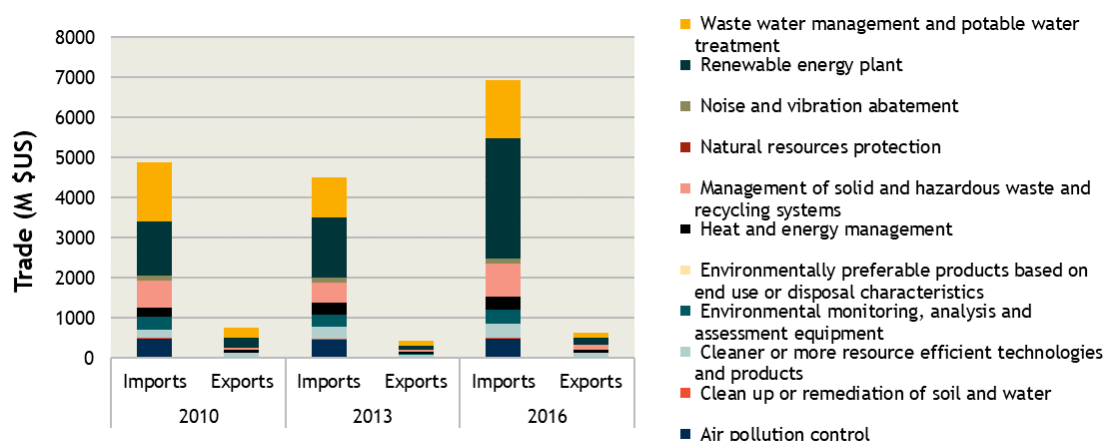
In the late 1990s, the OECD has developed a list of sectors that deliver (as part of their output) environmental goods and services. In several economic databases the level of activity in these 'environmental goods and services sectors' is monitored, to provide a proxy of the volume of trade in environment-related 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 2010, the environmental goods and services sectors accounted for 5% of the total trade volume and over the years this share increased steadily to 7% in 2010. When looking at the trade balance, we see that imports dominate trade in environmental goods and services, where renewable energy technologies, water treatment technologies and waste management systems account for the largest part of the imports (

Figure 2-99).

¹⁹ UN Comtrade

²⁰ Eurostat - International trade in goods by partner.

Figure 2-9 Trade of environmental goods and services in Egypt for the years 2010, 2013 and 2016.



Source: OECD - Trade in Environmental goods and services.

2.4 Existing awareness and capacities on CE in Egypt

Initiatives raising awareness on CE in Egypt are scarce. Yet, awareness creation often forms a central part of other CE-related concepts, such as the green economy, sustainable consumption and production and for the most part focus on related (sub-)components of the concept as well as end-of-life/waste management approaches. Important development in this field include, among other things, the publication of the “Sustainable Development Strategy: Egypt Vision 2030”. Key policy frameworks related to this strategy are the Action Plan for Sustainable Consumption and Production from 2016 and the Work Plan and Strategy for a Green Economy from 2010.

The SCP Action Plan aims to promote activities in the field of integrated waste management, including prevention, reduction, recycling, reuse and recovery, by improving accessibility to information, data and level of awareness. Furthermore, in September 2014, Egypt submitted a draft national strategy for integrated solid waste management, which, on behalf of the government, aims to promote legislative changes and structural reforms to promote a circular economy. An important part of the strategy was based on raising public awareness and facilitating community engagement. The results of said awareness raising strategies are, however, still to be assessed. Awareness for other CE related approaches such as eco-design or alternative business models for a circular economy has yet to be created on a national scale.

All in all, large-scale efforts to assess business and consumer awareness on aspects related to CE have been scarce and comprehensive assessments are unavailable at the current point in time. This is further elaborated in Annex 2.

3 Impacts and benefits of the CE in Egypt

3.1 Existing impacts and benefits

3.1.1 Economic impacts and benefits

The implementation of national policies and initiatives that are related to circular economy had several positive economic impacts and benefits that include: creation of new business opportunities, increasing international competitiveness of some sectors and increase of exports, transforming waste into more valuable projects creating revenues and mobilizing funds for new projects. The following table summarizes some positive economic impacts resulting from the adoption/implementation of a number of projects/programmes/initiatives that are thoroughly indicated in Annex 3.

Table 3-1 Economic Impacts and benefits from implementing CE in Egypt

Project/ Programme/ Initiative	Economic impacts and benefits
National Solid Waste Management Plan	<ul style="list-style-type: none"> – Creating innovative financial tools and policies and encouraging private sector and civil society to establish and operate waste management projects – Creating new business opportunities (e.g. Composting of agricultural wastes to be used as fertilizers) – Establishing the infrastructure required for of waste treatment, recycling, composting, production of RDF (Refuse - Derived Fuel), disposal facilities and transfer stations – Supplying mobile equipment for primary and secondary waste collection and transportation.
Waste Marche	<ul style="list-style-type: none"> – Creating an online platform linking stakeholders in the industrial waste management market
Tagaddod	<ul style="list-style-type: none"> – Transforming waste (cooking oil) into valuable biofuels that are exported to seven EU countries.
Bariq	<ul style="list-style-type: none"> – Transforming waste bottles into valuable RPET pellets to be exported
Utilization of alternative fuels in the cement sector ²¹	<ul style="list-style-type: none"> – Creating a new market for the collection and preparation of alternative fuels – Transforming agricultural wastes into valuable fuels that generate revenues instead of burning them at agricultural fields.
Imkan	<ul style="list-style-type: none"> – 57 business opportunities in waste management, renewable energy, and agroindustry – 22 enterprises kick-started and grew their businesses in waste management, renewable energy and agroindustry
Green Star Hotel - Tourism	<ul style="list-style-type: none"> – International recognition and competitiveness of certified hotels for improving their environmental performance – Reduction of operational costs for the certified hotels as a result of energy and materials savings
IEE Unido (http://ieeegypt.org/)	<ul style="list-style-type: none"> – Building capacities of national banks on financing energy efficiency projects

²¹ initiative supported by low carbon roadmaps for the cement industry in Egypt

Project/ Programme/ Initiative	Economic impacts and benefits
	<ul style="list-style-type: none"> Energy savings from industrial facilities reached around 1200 GWh per year, translated into revenues that could commonly be used to finance new projects to improve the environmental and energy performances of these facilities.
Switch MED	<ul style="list-style-type: none"> The project has estimated 10 million euros of annual savings achieved for the 28 companies participating in the project at an investment of 35.7 million euros. Such savings resulted from resource efficient and cleaner production measures in the food, textiles and chemicals subsectors
Better cotton initiative	<ul style="list-style-type: none"> Increasing competitiveness of the Egyptian Cotton industry Developing stakeholder linkages with international brands such as Hugo Boss to promote for the Egyptian cotton in global markets

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, raising awareness among the public on better waste management practices and improved health conditions of the public as a result of safer waste management practices. The following table summarizes some positive social impacts resulting from the adoption/implementation of projects/programmes/ and initiatives that are thoroughly indicated in Annex C.

Table 3-2 Social Impacts and benefits from implementing CE in Egypt

Project/ Programme/ Initiative	Social impacts and benefits
National Solid Waste Management Plan	<ul style="list-style-type: none"> Creating new job opportunities for consulting services related to the preparation and implementation of the programme Transferring of know-how by a group of international and national consultants to introduce technical support for all matters related to solid waste management
Waste Marche	<ul style="list-style-type: none"> Creation of new job opportunities in the whole chain of industrial waste management Improving awareness on industrial waste management
Tagaddod	<ul style="list-style-type: none"> Creation of new job opportunities in the whole chain starting from collection of used cooking oil, transporting it to the refining plant and exporting it Improving public awareness on recycling of cooking oil instead of disposing it into the national sewer system
Bariq	<ul style="list-style-type: none"> Raising awareness on recycling of plastic bottles instead of their disposal or combustion in landfills Creation of new job opportunities at the recycling facilities of Bariq
Utilization of alternative fuels in the cement sector ²²	<ul style="list-style-type: none"> Raising awareness among farmers to recycle agricultural residues and generate revenues from selling these agricultural residues to waste recycling companies them instead of burning them Improved health condition of the public as a result of avoidance of agricultural residues burning which caused the black cloud phenomenon each year
Imkan	<ul style="list-style-type: none"> Creation of 279 new job opportunities for youth Training of 1778 students in technical secondary schools on entrepreneurship

²² initiative supported by low carbon roadmaps for the cement industry in Egypt

Project/ Programme/ Initiative	Social impacts and benefits
	<ul style="list-style-type: none"> – Capacity building of 316 youth, with upgraded skills and career prospects in agriculture
Green Star Hotel - Tourism	<ul style="list-style-type: none"> – Providing capacity building for hotels managers, operators and staff to achieve and maintain GSH certification – Increased operational efficiency of certified hotels.
IEE Unido (http://ieeegypt.org/)	<ul style="list-style-type: none"> – Training of 75 industrial enterprises on identifying energy efficiency measures, with a focus on no/low cost measures – Training over 700 local consultants on the establishment and implementation of energy management systems in accordance with ISO 50001 standard
Switch MED	<ul style="list-style-type: none"> – Training of 180 individuals from consultancies, governmental institutions and industrial facilities on the tools of the switch med project that estimate and verify resources savings (energy, water and materials), and follow the progress of identified resource efficiency programs for each facility in the food processing, textiles, chemicals subsectors.
Better cotton initiative)	<ul style="list-style-type: none"> – Training of 400 cotton growers on reducing water and pesticide consumptions in the cotton agriculture process – Training of 35 fashion young designers and readymade garment producers on sustainable fashion designs in cooperation with Italian fashion designers and university professors from Politecnico de Milano – Training of 30 readymade garment technicians on chemical management using the Zero Discharge of Hazardous Chemicals programme – The project developed curricula on organic farming practices, spinning, weaving and finishing and entrepreneurship for implementation in technical secondary schools

3.1.3 Environmental impacts and benefits

The implementation of projects/programmes/ 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 instead of their disposal and many other benefits that are detailed in the table below.

Table 3-3 Environmental Impacts and benefits from implementing CE in Egypt

Project/ Programme/ Initiative	Environmental impacts and benefits
National Solid Waste Management Plan	<ul style="list-style-type: none"> – Closure of existing open dumpsites – Implementation of effective policy, legislation and institutional arrangements for waste management at the national, – Advising the government on waste management and environmental issues – Reduction of GHG emissions as well as other hazardous emissions resulting from open dumping and burning of wastes which in turn will lead to improved air quality, aesthetic views and health conditions of the public.
Waste Marche	<ul style="list-style-type: none"> – Recycling and reusing of industrial wastes instead of landfilling them
Tagaddod	<ul style="list-style-type: none"> – Recycling and reusing of cooking oil instead of its disposal in public sewers system causing blockages to the systems and increase in the oil and grease content of wastewater.

Project/ Programme/ Initiative	Environmental impacts and benefits
Bariq	<ul style="list-style-type: none"> – GHG emissions reductions resulting from producing plastics from recycled materials; estimated at 1.5 tonnes of CO₂ savings for each ton of recycled PET plastics – The project has recycled 10 million bottles, that would have been otherwise been disposed in open dumpsites or landfills
Utilization of alternative fuels in the cement sector ²³	<ul style="list-style-type: none"> – Reduction of GHG emissions from the cement sector as a result of using alternative fuels with lower CO₂ emission factor than fossil fuels – Improved air quality by utilizing agricultural residues instead of their open burning in fields leading to the yearly black cloud phenomenon
Imkan	<ul style="list-style-type: none"> – Improved air quality by utilizing agricultural residues instead of their combustion
Green Star Hotel - Tourism	<ul style="list-style-type: none"> – Reduced energy and water consumption at the certified hotels – GHG reductions as a result of energy savings
IEE Unido (http://ieeegypt.org/)	<ul style="list-style-type: none"> – Reduction of 2.44 million tCO₂e between 2013- 2015 as a result of the following energy savings: <ul style="list-style-type: none"> • Cement sector: 52 PJ/year in 11 plants • Fertilizers sector: 36.5 PJ/year in 5 plants • Iron and steel: 11 PJ/year in 8 plants – Implementation of energy management systems in accordance with ISO 50001 at 14 industrial enterprises
Switch MED	<ul style="list-style-type: none"> – The project Identified the following resources savings opportunities in industrial facilities (food processing, textiles, chemicals): <ul style="list-style-type: none"> • 449.2 GWh in annual energy consumption • 2 million m³ of water savings • 12,246 tons solid wastes avoided
Better cotton initiative	<ul style="list-style-type: none"> – 4 cotton demonstration plots launched in collaboration with agricultural cooperatives and the Cotton Research Institute Research Station – Training of 400 cotton growers on reducing water and pesticide consumption and contamination control during harvest and post-harvest – Training of 30 readymade garment technicians on chemical management using the Zero Discharge of Hazardous Chemicals programme

3.2 Future Impacts and benefits of a CE transition in Egypt

As the Egyptian 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 Egypt.

3.2.1 Modelling approach and framework

The modelling of the macro-economic impacts of the circular economy transition in Egypt 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 B).

²³ initiative supported by low carbon roadmaps for the cement industry in Egypt

A conventional difference-to-baseline approach is followed. The circular economy (CE) scenario is compared against a baseline²⁴ in which no explicit assumptions are made about CE 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, 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 Egypt by 2030 and used these as inputs into the model. These model inputs are summarised in the table below.

²⁴ The baseline is E3ME’s standard projection to 2030 for the Egyptian economy, based on official published economic and energy forecasts. See Annex B for more details.

Table 3-4 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 Egypt would have a positive impact on the Egyptian economy. By 2030, Egypt's GDP is projected to be around 1% higher in 2030 in the circular economy scenario compared to the baseline scenario. In other words, this suggests that the Egyptian 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.** 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 3-5 Macro-economic impacts of the CE scenario

Variable	Absolute difference from baseline scenario by 2030 (€2019)	Relative difference from baseline scenario by 2030 (%)
GDP	+ €5.2bn	+ 1.0%
Consumer	+ €2.6bn	+ 0.6%
Investment	+ €1.7bn	+ 1.5%
Exports	+ €212m	+ 0.3%
Imports	- €685m	- 0.6%
Price level	-	- 0.6%

These results suggest that the positive economic impacts would be mostly generated by higher consumption and investment, with an improvement in the trade balance contributing a smaller amount to national incomes.

Some of these impacts can be attributed to the direct effect of the input assumptions in the circular economy scenario. The projected fall in gross imports relative to the baseline is attributable to an assumed fall in agricultural imports of €1.1bn (see Table F3, Annex F), a consequence of better prevention of food losses in agricultural supply chains. A small portion of the investment impact is also directly driven by scenario assumptions of increased investment in the agricultural and recycling sectors, which account for around €340m of the total €1.7bn investment impact.

However, much of the impact would equally result from the downstream effects of these and other circular economy activities. Most significantly, rising output in key circular economy sectors including agriculture and waste management would generate higher employment in those sectors (see next section), leading to higher disposable incomes for consumers, which would be recycled through greater consumption spending on sectors such as financial and business services, education and health, and agriculture. This mechanism accounts for the large boost to consumer spending seen in the CE scenario relative to the baseline.

Furthermore, the additional demand resulting from the impacts described above would lead businesses to increase their expenditure on investment and intermediate production inputs. In this way, the economic impact would flow through to other sectors in the economy, notably construction (which benefits from higher investment spending) and financial and business services (which is an important supplier for a wide range of sectors).

Finally, circular economy activities would have downstream effects on the trade balance. On the one hand, some of the higher demand from consumers and businesses would be spent on imported goods and

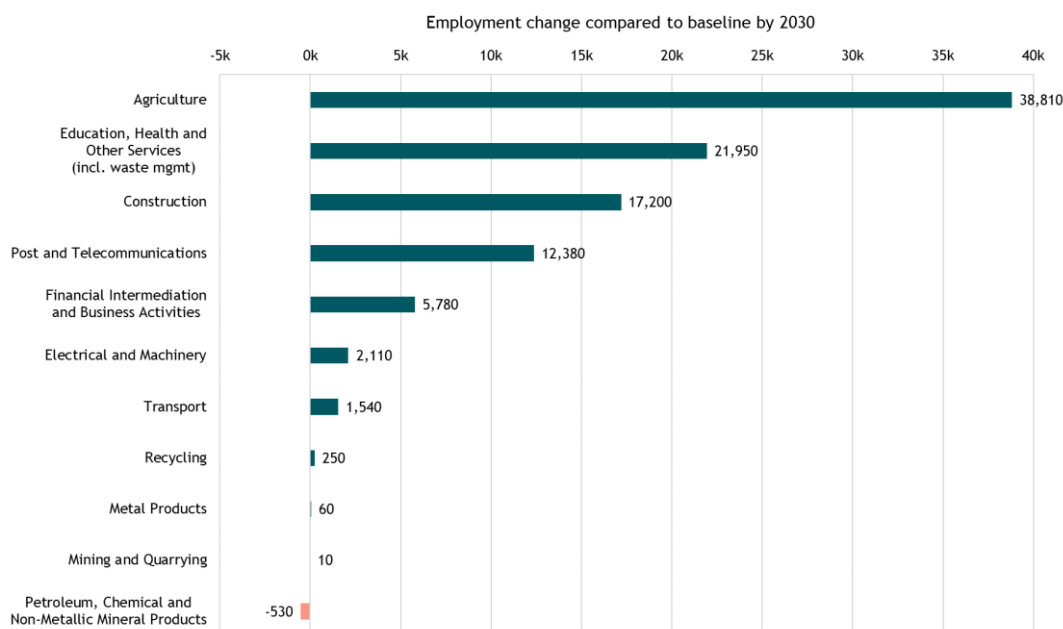
services. This would dampen the impact of the assumed €1.1bn fall in agricultural imports, leading on net to a smaller projected reduction in gross imports of around €685m. The increasing competitiveness of the agricultural sector would also allow it to export some of its produce, which along with the scenario assumption of increased exports of recycled materials from e-waste, would contribute positively to the trade balance.

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 Egypt would also have positive employment effects. Overall, a net increase in employment relative to the baseline scenario of around 0.3% is projected, or approximately 101,000 additional jobs compared to the baseline (see 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 over a third of the net employment impacts seen in the modelling results. Similarly, large employment impacts would also be seen in the waste management sector, as output and employment would need to increase in order to achieve a more ambitious waste collection rate. These impacts would be a direct consequence of greater circular economy activity in these sectors.

Employment in other sectors would benefit indirectly from circular economy activities. The relative increases in consumer spending, intermediate demand and investment expenditure resulting from these activities, as described in the previous section, would lead to greater demand and employment across many sectors. In particular, construction employment would increase as a result of greater investment expenditure, while higher consumer and business spending would lead to higher employment in telecommunications and financial and business services.

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 slightly larger decline in employment in the petrochemical sector.

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 Egypt would produce higher carbon emissions than in the baseline, with CO₂ emissions forecast to be 1.3% higher than baseline levels by 2030.²⁵

The transport and power generation sectors, among the most energy- and carbon-intensive sectors in the Egyptian 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 and electricity would increase, leading to greater consumption of fossil fuels for energy. For the impacts of circular economy activities to be carbon neutral, Egypt would likely need to take separate measures to ensure that the transport sector sees higher take up of renewable energy sources.

Substantial 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. Our results suggest that these additional recycling emissions would far outweigh the lower emissions in the petrochemicals sector, whose output of virgin materials we have assumed would be replaced by recycled materials. This suggests that increasing circularity of production would not necessarily help to 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

²⁵ 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.

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. It is surely the case, however, 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 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 Egypt, 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 Egypt, 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 don't 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 Circular economy-related cooperation between the EU and Egypt

4.1 Policy dialogues

The framework for political collaborations of the EU with neighbouring countries is set by the European Neighbourhood Policy (ENP), which is the central strategic approach for interactions with its neighbours in Eastern Europe, the Middle East and Northern Africa. The ENP, which was launched in 2004, is financed by the European Neighbourhood Instrument (ENI) and has led to intensified cooperation between the EU and Egypt.

Another important element in the cooperation discussion is the development of the European Green Deal which places the concept of circular economy at the centre of efforts to transform the European Union into a fair society. The communication of the European Green deal states that “the Africa-Europe Alliance for sustainable investment and jobs will seek to unlock Africa's potential to make rapid progress towards a green and circular economy including sustainable energy and food systems and smart cities”²⁶ with the aim of accelerating the achievement of Paris Agreement targets of the for both continents. The European Green Deal is considered a priority for the EU-Commission and will be reflected in the dialogues and cooperation with 3rd countries, which is expected to influence the policy dialogue with Egypt.

One of the first results of the ENPs enhanced efforts to address collaboration with neighbouring countries was the EU-Egypt Association Agreement (AA). The AA was ratified in 2004 and was further strengthened through the EU-Egypt Action Plan, which provided a basis for enhanced cooperation and bilateral support in 2007. In 2017, the Association Council - the statutory body reviewing the state of EU-Egypt bilateral relations - developed the multiannual framework EU-Egypt Partnership Priorities 2017-2020 in 2017 in order to specify joint priorities for further collaboration between both parties²⁷. As a result of the bilateral dialogue, the parties agreed on 3 overarching Partnership Priorities (PPs), which form a vital component for the political engagement and enhanced cooperation between the EU and Egypt in the period between 2017 to 2020. The principals, which are currently being reviewed, are a key reference point for the EU support and assistance provided to Egypt and aim to facilitate Egypt's transition towards a sustainable, modern economy in line with Egypt's Sustainable Development Strategy - Vision-2030. In this context, several sub-committee meetings have been organized between Egypt and the EU. CE-related aspects are mainly discussed as part of the sub-committee on Transport, Energy and Environment, as well as during cross-cutting cluster meetings on economy and socio-economic development. In its most recent meeting on the 16th of June 2019, the subcommittee discussed, among other things, recent policy updates including the EU circular/ green economy developments, as well as the Egyptian sustainable development strategy, national strategy of biodiversity, waste management and transition to a circular economy strategy.^{28 29}

²⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1588580774040&uri=CELEX%3A52019DC0640>

²⁷ https://ec.europa.eu/commission/presscorner/detail/en/IP_17_4222

²⁸ <https://www.consilium.europa.eu/media/23942/eu-egypt.pdf>

²⁹ https://eeas.europa.eu/delegations/egypt/64233/7th-meeting-subcommittee-transport-energy-and-environment-under-eu-egypt-association-agreement_en

On November 26th, 2019, representatives from the EU and Egypt convened for the 7th EU-Egypt Stability and Social Development Cluster Meeting. The meeting addressed the most recent developments in research and innovation, education, culture and youth. Although CE did not form a central pillar of the meeting, both countries stressed the importance of cooperating in the fields of research and innovation, amongst other topics. Egypt and the EU also reiterated that a bilateral dialogue on the latest research and innovation policy developments will be vital in developing domestic capacities.³⁰

Besides the dialogues held within official cooperation frameworks, policy dialogues have been essential for Egypt's coordination with donor groups. Projects within the waste sector have led to established policy dialogues between the ministries responsible for implementation and the project-associated donors. For instance, EU-supported conferences on water scarcity, such as the Cairo Water Week, which also included discussions water recycling systems, have been established as important dialogue forums between leading officials on both sides. For more information on development cooperation activities, please refer to section 4.1.2 below.

Research and innovation platforms (see section 4.6) also offer potential for continuous policy dialogues. A recent example in this context, is the session on science diplomacy and the prospect in the EUROMED region organised by the EU in Alexandria.³¹ Publicly held EU-events also serve as exchange forum for CE-related activities between both parties. The previously mentioned Cairo Water Week was put forward as a primary example for collaboration in the fields of social and sustainable development, yet did not explicitly highlight the importance CE-principles in (waste) water management.³² However, during the EU Climate Diplomacy Week in October 2019, the head of the EU delegation Ivan Surkos pledged for further collaboration with the Egyptian Ministry of Environment and other actors to address issues of sustainability, climate change and circular economy.³³

Other international events such as the 14th Meeting of the Conference of the Parties to the Convention on Biological Diversity (COP 14), held in Egypt from 17th to 29th November 2018, also serves as a valuable basis for policy dialogues. During the conference, the EC welcomed Egypt's "Action Agenda for Nature and People", which aims to inspire and take meaningful steps towards building a future global sustainable economy within Egypt³⁴.

As a result of the longstanding partnership between Egypt and Germany, the Germany Embassy initiated the "Cairo Climate Talks" at the end of 2011. The Cairo Climate Talks are now in their 62nd rendition and have offered a platform for a variety of CE related topics, such as general waste management, sewage treatment or reduction of plastic waste generation. Notably, at the 58th Cairo Climate talks, the parties concluded the meeting with the general understanding that CE can create a paradigm shift for Egypt's waste management sector.³⁵

³⁰ https://eeas.europa.eu/delegations/egypt/71267/eu-egypt-stability-and-social-development-7th-cluster-meeting_en

³¹ https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/report_on_eu-egypt_relations_in_the_framework_of_the_revised_enp.pdf

³² https://eeas.europa.eu/delegations/egypt/61171/europe-day-cairo-working-strengthening-partnership-egypt_en

³³ <https://www.cairoclimatetalks.net/events/eu-climate-diplomacy-week-engagement-civil-society-organizations-waste-management-and-plastic>

³⁴ <https://www.cbd.int/cop/cop-14/annoucement/nature-action-agenda-egypt-to-china-en.pdf>

³⁵ <http://www.cairoclimatetalks.net/events/circular-economy-entrepreneurship-waste-management>

In summary, CE has not yet played a major role in policy dialogues between the EU and Egypt. Although some exchanges have addressed sub-aspects of CE in certain sectors (e.g. utilisation of wastewater and agricultural residues), the concept as such remains yet to be explicitly integrated into the political agenda and relevant policy dialogues shared between both parties.

Table 4-1 Opportunities and barriers for an Egypt-EU policy dialogue on CE

Opportunities and barriers for Egypt-EU dialogue on CE
<ul style="list-style-type: none"> • CE has not become an institutionalised cornerstone in the bilateral policy dialogue between Egypt and the EU yet. Instead, CE is mainly discussed as part of the sub-committee on Transport, Energy and Environment as well as part of cluster meetings on economy and socio-economic development. This offered so far offers the opportunity to discuss CE in a more institutionalised fashion in order to determine the most pressing needs for support across selected priority sectors (e.g. water, agriculture and/or MSW). • Existing EU-Egypt Association Agreement provides a basis to incorporate circular economy in future policy dialogues between the two parties, however enhanced cooperation provisions/commitments would be needed to address common challenges • The Egyptian government has not yet set clear priorities nor action plans related to circular economy. Although the green economy strategy framework and the National SCP action plan identified sectors and actions with high priorities, there is no clear direction from the Egyptian government towards the implementation of CE measures, and the existing policies are not considered sufficient to achieve transition towards CE in Egypt. A clear framework strategy and investment plan from the Egyptian government side are needed to identify CE opportunities. This framework should also aim to address social aspects (such as creation of new job opportunities and supporting MSMEs) in the identified CE opportunities • Relevant stakeholders for continued CE-related policy dialogues have not yet been systematically identified. Identifying such stakeholders is of primary importance to facilitate the cooperation between the EU and Egypt on CE related policy dialogues. Several stakeholders have been initially mapped with relevance CE cooperation on the policy dialogue level between Egypt and EU, however a leading entity should be selected for the adoption of CE measures per sector.³⁶ • Policy Dialogue on CE should be aligned with the common EU-Egypt objectives in this area and the national circumstances and priorities of the Egyptian government (e.g. possible inclusion of renewable energy/energy efficiency improvement projects and wastewater recycling projects in CE policy dialogues, since they represent high priority to the government) • Renewable Energy/Energy Efficiency topics are points of particular interest to the Egyptian government and could be a candidate topic for Egypt-EU dialogue on CE. Even though renewable energy/energy efficiency topics are not of particular focus of this report, there are still strong links between CE and EE that can be established.

³⁶ Ministry of Environment, Waste Management Regulatory Authority; Ministry of Industry; Ministry of Water Resources and Irrigation; Ministry of Agriculture and Land Reclamation; Ministry of Electricity and Renewable Energy; Egyptian Organization for Standardization & Quality; Ministry of Finance; Ministry of Investment and International Cooperation; Ministry of Planning and Economic Development; The Egyptian Micro, Small and Medium Enterprise Development Agency (MSMEDA); Egyptian National Cleaner Production Centre (ENCPC); Environmental Compliance Office - Federation of Industries (and Chambers of sectors with high priority); Green Tourism unit/ Ministry of Tourism; Industrial Modernisation Centre (IMC); Existing development cooperation projects in Egypt as well as European banks and DFIs; Research centres and institutions; Confederation of Egyptian European Business Associations (CEEBA); Private sector companies with relevance to the CE policy dialogue that can play an important role in the transition towards CE.

4.2 Development cooperation programmes, including by the EU Member State

The EU also adopted a Single Support Framework (SSF), a bilateral multiannual indicative program, which sets the priorities and the financial allocation in key strategic areas of bilateral cooperation with the country for the period between 2017 and 2020³⁷. The SSF further aims to improve the effectiveness of the projects and determines the overall EU financing, complemented by blending grants. As a result, the EU is supporting various development projects in Egypt through its Switch Mediterranean (SwitchMed) Programme. The program is implemented by the United Nations Industrial Development Organisation (UNIDO), the UN Environment's Economy Division, the UN Environment Mediterranean Action Plan and its Regional Activity Centre for Sustainable Consumption and Production (SCP/RAC). By supporting and connecting local stakeholders that promote social and ecological innovations, SwitchMed primarily seeks to create productive, circular and sharing economies in the Mediterranean.

The program, which is currently in its second phase (running from 2019-2022) and awaits the official approval to start operating in Egypt, is equipped with a budget of EUR 16,4 million (EUR 15 million as EU contribution)³⁸. It has three key components: first, a regional and national policy component, which directly supports countries in the Mediterranean region to develop and implement SCP policies; second, a demonstration activity component, which targets both well-established companies and start-ups to support the adoption of SCP patterns at different stages of business development; and third, a networking component, which connects stakeholders to foster regional exchange and cross-fertilisation. However, the second phase has still not yet been officially granted approval to start operating in Egypt.

From 2015 to 2018, the SwitchMed funded a demonstration project “MED TEST II”. Building on the Resource Efficient Cleaner Production (RECP) methodology, the project aimed at Transfer of Environmentally Sound Technologies (TEST) by providing direct consultancy services to industries with regards to minimisation of environmental impacts³⁹. The Project was implemented by the Egypt National Cleaner Production Centre (ENCPC) and supported by various other public institutions in Egypt, including, amongst others, the Ministries of Trade and Industries and the Ministry of Environment. In total 28 industries from the chemical, food, and textile sector were targeted by the MED TEST II project. The companies' profiles ranged from SMEs with 15 employees, to larger manufacturers with 1200 employees and were situated in Alexandria, Cairo and El-Sadat⁴⁰.

The project enabled the 28 industries to identify 192 RECP measures with the potential to annually save 411 GWh of energy, 2 million m³ of water, and 5,111 tons of raw materials. Total investment costs for the RECP measures were determined to be 36.5 million euros, while annual savings of 10.6 million euros in production costs would eventually offset the investment costs. According to the SwitchMed Egypt Magazine, approximately 77% of the RECP measures were approved by the management of the selected companies and hence included in the SwitchMed action plan for implementation in 2018. Some of these measures included intensive wastewater recycling or the use of locally sourced recycled PET resins for packaging production⁴¹.

³⁷ https://ec.europa.eu/commission/presscorner/detail/en/IP_17_4222

³⁸ <https://www.euneighbours.eu/en/south/stay-informed/projects/switchmed-ii>

³⁹ Green Paper on Scaling-Up of MED TEST II Activities

⁴⁰ https://www.switchmed.eu/en/corners/service-providers/actions/MED_TEST_II_progress

⁴¹ <https://www.switchmed.eu/en/corners/service-providers/actions/med-test-ii-countries/Egypt>

The third phase of MED-TEST III is planned to be launched. It will focus on CE in the textiles sector, with the aim of valorising waste from the textiles sector into valuable products by developing circular value chains in the textile industry⁴².

Another project implemented as part of the SwitchMed is the development of Green Entrepreneurship project between 2014 and 2018. The project comprised a training programme, consisting of a five-day module delivered over three months, in order to equip local entrepreneurs with the necessary tools and proficiencies to develop their own business ideas. Circular economy principles formed a cornerstone of the training program, as participants were heavily encouraged to apply environmental sustainability to the various dimensions of their product or services. In Egypt, 2300 green entrepreneurs were selected and underwent the training programme, 166 of those were selected for additional individual coaching in order to further improve their green business models, while 157 entrepreneurs submitted an application for the incubation phase. In the end, 49 were selected by an International High-Level Jury⁴³. A selection of businesses integrating CE-thinking, which underwent the training provided by the SwitchMed Project and were subsequently granted financial support for their incubation phase are listed below.

Table 4-2 Entrepreneurs granted financial support for their incubation phase

Company	Business Model
ECO Food Dehydrators	Food security through dehydrators: reduction in crop waste by providing farmers with innovative solar food dehydrators for their products
VWASTE	VWaste transforms orange peel waste from juicing companies into raw orange peel powder
War2a	Start-up that collects and recycles wastepaper material discarded after consumer use in educational institutes and universities

Additionally, the SwitchMed project encompasses a platform for inspiring green entrepreneurs and changemakers in the Mediterranean region, the so-called Switcher platform. Currently there 53 initiatives from Egypt on the Switcher platform, which set a positive example of how businesses can thrive under the premise of sustainable production cycles. Furthermore, SwitchMed also supports community-based social eco-innovation initiatives to maximize their impact and influence, in order to advance sustainable production and consumption measures within the partnering countries. Similar to the green entrepreneurship programme, this support framework also consists of a 4-day training for civil society grassroot organisations. Amongst the organisations, one can find cycling communities, waste recycling initiatives, garbage collection approaches and awareness building programmes in CE-relevant fields⁴⁴.

Following a similar objective of capacity enhancement of the labour force in Egypt, the European Training Foundation (ETF) has been working closely with Egyptian institutes since 2008. The objectives of the ETF are closely related to the common challenges addressed within the EU-Egypt Partnership Priorities 2017-2020. The ETF is particularly involved in supporting the Egyptian operation of technical vocational education and training and is one of the main donors for Egypt⁴⁵. Although no CE related components are

⁴² https://www.unido.org/sites/default/files/files/2020-01/MED%20TEST%20III%20Textile_sector_digital.pdf

⁴³ <https://circulareconomy.europa.eu/platform/en/good-practices/switchmed-green-entrepreneurship-programme>

⁴⁴ All the info was taken from the SwitchMed Magazine Egypt

⁴⁵ https://www.etf.europa.eu/sites/default/files/document/Country%20Strategy%20Paper%202017-20%20Actions%202020_Egypt%20.pdf

prevalent, the educational sector offers many opportunities to disseminate CE related concepts (please also refer to section 2.5.2)⁴⁶.

In the solid waste management sector, the European Bank for Reconstruction and Development (EBRD) is currently supporting four projects in the water and sanitation sector, which have resulted in several exchanges between collaborating institutions. Further support is provided by other EU donors, such as Denmark, Finland, Germany and Italy. In this context, EU support of the National Solid Waste Management Programme has instigated coordination between the European partners (KfW, GIZ and Swiss Development Cooperation) and the implementing Egyptian agencies, such as the Ministry of Environment, the Environmental Affairs Agency, and the Solid Waste Management (SWM) Regulatory Agency. The Programme receives technical support through a dedicated project implemented by the GIZ, which runs from 2019 to 2022.

Another example includes the EU Joint Rural Development Project, an EU-funded project implemented by the Italian Cooperation Office over the period of 2014 to 2020. With a grant sum of EUR 21.8 million, the project aimed at the improvement of underprivileged rural families' livelihood and a sustainable production increase in agricultural products in three regions of Egypt: Marsa Matruh, Fayoum and Minia. CE-related measures included the reduction of water losses and the development of efficient farming measures with rural farmers. The Italian Cooperation Office provided an additional EUR 11 million in the same regions for socio-economic development and agricultural mechanisation.⁴⁷

Other development projects conducted between Germany and Egypt, include the “Participatory Development Programme (PDP) in Urban Areas”. The PDP, commissioned by the BMZ aims at improving the capabilities of the urban population, so that they are able to address the prevalent issues within their settlements. The project enabled communities to improve their waste management infrastructure and to properly integrate informal sectors within established waste management processes.⁴⁸

Another successful, but significantly smaller development cooperation project was the EU-initiated beach clean-up event in Alexandria. Under the pretext of the International Coastal Clean-Up Day, 300 volunteers participated in the clean-up of the beach in Alexandria. Amongst the participants were local environment initiatives, staff of the EU delegations and the member states as well as students.⁴⁹

In summary, the donor-funded project landscape in Egypt covers a diverse set of issues but seldom addresses CE as an overarching economic model. Although many projects relate to CE-principles, they are neither subsumed under the umbrella of the CE-terminology and tend to address different lifecycle stages (production, consumption, end-of-life management) in isolation, instead of pursuing and integrated, circular approaches. This applies not just to both EU-directed cooperation activities and programmes/projects funded by EU member states.

⁴⁶ <https://www.etf.europa.eu/en/news-and-events/news/egypt-awarded-best-entrepreneurship-project-helsinki>

⁴⁷ https://eeas.europa.eu/delegations/egypt_sk/8739/EU%20Joint%20Rural%20Development%20Project

⁴⁸ <https://www.giz.de/en/worldwide/16278.html>

⁴⁹ https://eeas.europa.eu/delegations/egypt/50523/300-volunteers-participate-eu-beach-clean-event-alexandria_en

Table 4-3 Opportunities for an Egypt-EU cooperation on development cooperation programmes on CE

Opportunities for Egypt-EU cooperation on CE
<ul style="list-style-type: none"> • Making CE part of into the EU's development cooperation programmes offers the opportunity to establish itself as a front-runner in this area. To this regard, the SWITCHMED programme is uniquely placed for integrating CE more explicitly and strategically into its core activities. According to its mission statement, SWITCH MED already seeks to address circularity¹; yet most of its activities have so far focused on resource efficient and cleaner production (RECP) and have put less emphasis on consumption aspects. Since the transition to a CE will require mainstreaming new consumption models and increased consumer awareness, this may provide a unique starting point of intervention. • Aligning of development programme/project objectives with the national priorities and circumstances, and the involvement of the ministry of planning and finance, together with the ministry of environment to may support the integration of CE objectives • Improving the involvement of private sector, especially in the waste management context through the whole value chain (waste collection, transportation, sorting, treatment and disposal) would be a good opportunity to for future CE-related development cooperation. This might for instance be achieved through industry incentives (e.g. long-term contracts) and/ or awareness raising on CE topics among industrial facilities, especially MSMEs. The efforts may also benefit from new guidelines and tools on how to achieve CE objectives • Increased engagement of the informal waste sector is necessary to avoid the disruption of the whole waste management process. This approach has already been adopted by the NSWMP in one of the projects in Qalioubia governorate. • A great potential of future development projects lies in the transfer of technology and know-how for the implementation of CE-related projects. Both are often lacking to realise identified opportunities in economic sectors (e.g. textiles).

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

To boost investments in Africa and the European Neighbourhood, the EU adopted the External Investment Plan (EIP) in 2017, which aimed to de-risk future investments and leverage match-funding together with financial institutions. At its core, the EIP aims to i) contribute to the achievement of the UN's Sustainable Development Goals (SDGs) while tackling the root causes of migration; and ii) mobilise and leverage public and private investments to improve economic and social development with a particular focus on decent job creation.⁵⁰ Key investment windows include:

- Sustainable energy and connectivity;
- Micro, Small and Medium-sized Enterprises (MSMEs) financing;
- Sustainable agriculture, rural entrepreneurs and agribusiness;
- Sustainable cities;
- Digital for development.

Under the EIP the EU has earmarked 4.6 billion EUR to the European Fund for Sustainable Development (EFSD), the plans key financing instrument, and seeks to leverage investments by an order of magnitude (i.e 44 to 47 billion EU by 2020).^{51,52} The EFSD blended finance operations are composed of two regional

⁵⁰ https://ec.europa.eu/commission/eu-external-investment-plan/what-eus-external-investment-plan_en#abouttheplan

⁵¹ https://ec.europa.eu/commission/sites/beta-political/files/update4_jan20_factsheet_eip_en_0.pdf

⁵² https://ec.europa.eu/commission/sites/beta-political/files/eip_leaflet_africa_-_neighbourhood_en_0.pdf

investment platforms: the Africa Investment Platform (AIP, formerly the AfIF) and the Neighbourhood Investment Platform (NIP, formerly the NIF).

Under the European Neighbourhood Instrument (ENI) for the period 2014-20, the EU's key financial instrument for cooperation with Egypt ⁵³, the NIP channels a considerable amount of EU funding available to Egypt. The ENI is managed by the Directorate General for Neighbourhood and Enlargement Negotiations and replaces the European Neighbourhood and Partnership Instrument (ENPI) of 2007-2013

Besides the ENI, financial support to Egypt is also provided by EU DFIs such as the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD)⁵⁴.

EIB

The EIB has been active in Egypt since 1979 and has financed 115 projects in the country. Egypt was among the nine focus countries in the Southern Neighbourhood region targeted in the EIB's Economic Resilience Initiative (ERI), which was launched in 2016 as the European Union's response to the challenges in the region such as forced displacement and migration, economic downturns, political crises, droughts and flooding. The ERI was implemented in close cooperation with the European Commission and several European countries including Croatia, Italy, Lithuania, Luxembourg, Poland, Slovakia, Slovenia and the United Kingdom. Besides generally focussing on private sector growth, the initiative aims to develop a sustainable infrastructure⁵⁵. Its five targeted impact areas cover the creation of job opportunities (especially by lending to SMEs), cleaner water, improved public transport, supplying households with energy and the creation of further university facilities. Furthermore, the EIB and EU are currently in discussions with the Egyptian government on funding projects related to biogas generation from organic wastes such as sludge from sewage treatment plants, animal manure, agricultural waste, and also wastes from dairy products industrial facilities through soft loans that will be facilitated through MSEMIDA to business developers working in waste to energy field, or to facilities that generate these types of wastes and aim to develop projects that recycle these wastes.

As of 2019, eight projects in Egypt have been supported by EIB as part of the ERI. Improving the quality of water has been identified as a particular relevant focus area in Egypt. By providing a EUR 126 million loan under the ERI, a wastewater expansion project was initiated in the Fayoum Governorate. Aiming to improve the quality of reprocessed water as well as sanitation services for up to approximately 940,000 people, the project is planned to be implemented between 2018-2025. According to the EIB, the project involves, inter alia, the construction of eight new wastewater treatment plants (WWTPs), the expansion of nine existing WWTPs as well as the rehabilitation of ten existing WWTPs. The project is additionally backed up with EUR 37 million provided by the EBRD and the EU Neighbourhood Investment Facility (NIF)⁵⁶. Another wastewater treatment project based in Alexandria with a proposed budget of EUR 180 million aims to facilitate a more sustainable disposal and furthermore the utilisation of effluent and

⁵³ https://ec.europa.eu/neighbourhood-enlargement/neighbourhood/countries/egypt_en

⁵⁴ <http://www.europarl.europa.eu/factsheets/en/sheet/170/the-european-neighbourhood-policy>

⁵⁵ <https://www.eib.org/en/projects/regions/med/egypt/index.htm>

⁵⁶ <https://www.eib.org/en/press/all/2018-203-eib-finances-fayoum-wastewater-expansion-project-to-improve-sanitation-services-for-940000-people-in-egypt.htm#>

sludge, improve sustainable water resources management, and support the depollution of Lake Maryut and the Mediterranean Sea⁵⁷. The project is further backed by a EUR 20 million grant from the EU's NIP.⁵⁸

European Bank for Reconstruction and Development (EBRD)

To date, the EBRD has invested over EUR 2 billion in 36 projects in Egypt, of which 15 projects representing EUR 695 million were part of the so-called Green Economy Transition mandate, which specifically targets projects that contribute to environmental improvements. Egypt has been among the EBRDs focus countries during the recent years. This is reflected in the banks' annual investments, which was topped the second year in a row in 2019 with commitments of €1.2 billion in 26 projects⁵⁹. Besides supporting the transition to renewable energy, last year investment areas of the EBRD covered climate-related projects of SMEs, programmes to address unemployment within the young generation and to raise their skillsets.

In 2016 the EBRD in collaboration with several Egyptian governmental bodies and the Cement Sustainability Initiative (CSI) of the World Business Council for Sustainable Development (WBCSD) initiated the "Low-Carbon Roadmap for the Egyptian Cement Industry". This project discovered several potentials within the cement industry to improve the environmental performance of cement production by applying circular practices. It was found that almost 5% of clinker volume is discarded and landfilled as by-pass and cement kiln dust (BPD and CKD), which presents not only a loss in valuable resources but also results in energy losses and avoidable CO₂ emissions. Recovery, treatment and recycling of BPD and CKD were among the recommendation of the roadmap; however, it was highlighted that recycling processes may require a large amount of water as part of the recycling. Besides, the analyses suggested that excess heat as thermal energy could become recoverable along the process for instance in the cement mill for drying clinker⁶⁰. One of the most recent projects of the EBRD is the "Fayyoun Waste Water Expansion Programme", which has similar objectives to other previously carried out programmes (provision and improvement of sanitation services) and is endowed with €360 million in soft loans from the EIB and the EBRD, as well as a EUR 38 million grant⁶¹.

Collaborations between EU DFIs

In some cases, several European financing institutes join hands to finance projects of larger volume. One example is the "Improved Water and Wastewater Programme (phase I)" with a total budget of EUR 295 million (2012-2019). The project focussed on the provision of water and the improvement of wastewater services for the inhabitants of the regions Gharbia, Sharkia, Dameitta, and Beheira and received an EU grant of EUR 34 million. Additional funding was jointly provided by the Kreditanstalt für Wiederaufbau (KfW), EIB and Agence Française de Développement (AFD)⁶².

In 2018, KfW in collaboration with the AFD and the EIB launched the Clean Oceans Initiative. In conjunction with this initiative the KfW is co-financing a project in Egypt to expand infrastructure for waste collection and to support the development of recycling and treatment plants for communal waste along the Nile. The project is implemented in four of the 27 Governorates and foresees a EUR 70 million investment⁶³.

⁵⁷ <https://www.eib.org/en/projects/pipelines/all/20170089>

⁵⁸ <https://www.eib.org/en/press/all/2020-045-egypt-the-eu-bank-finances-the-upgrade-and-expansion-of-alexandria-west-wwtp>

⁵⁹ <https://www.ebrd.com/news/2020/egypt-again-tops-ebrd-investments-in-2019.html>

⁶⁰ <https://www.mofa.go.jp/files/000498434.pdf>

⁶¹ https://ec.europa.eu/commission/presscorner/detail/en/ip_17_4222

⁶² https://eeas.europa.eu/delegations/egypt/43749/improved-water-and-wastewater-programme-phase-i_en

⁶³ <https://www.kfw.de/stories/wirtschaft/infrastruktur/aegypten-abfallmanagement/>

Table 4-4 Opportunities for an Egypt-EU financial cooperation on CE

Opportunities for Egypt-EU cooperation on CE
<ul style="list-style-type: none"> • CE-related aspects have become an increasingly important part of financial cooperation between Egypt and the EU. Various projects signed by EIB and EBRD implicitly promote the transition towards CE in the area of water management, agriculture and pollution abatement through a mix of soft loans, grants and blended finance. • Untapped opportunities exist when looking at financing gaps in Egypt's solid waste management sector, the building and construction sector and the country's upcoming textile industry, where CE-financing has so far received comparatively little attention and could be supported by additional contributions from the EIB and EBRD. • With regards to the implementation of the EIP through the EU's EFSD, CE-financing has not been yet become a central pillar of investment activity. So far, no guarantees have been signed with domestic and cross-regional financing institutions relevant for Egypt, including the AfDB, the Islamic Development Bank (IsDB),¹ the Housing and Development Bank (HD Bank)¹ and/or the Export Development Bank of Egypt (EBE)¹. Advancing the deployment of CE-promoting financing instruments in close collaboration with these institutions offers the opportunity to mobilise significant investments from the private sector, while meeting the EU's investment targets in relation to the EFSD and accelerating the transition towards a CE in both Egypt and the EU. • As private sector companies are often unaware of the existing financing mechanisms that could support in the implementation of CE related projects, the support of awareness raising efforts on CE in the public and private sector, as well as mainstreaming CE among key players in the Egyptian Government (such as Ministries of Environment, Finance and Planning) is required • The rollout of financial instruments in Egypt is often hampered by both the absence of a clear regulatory framework that supports the transition towards CE and the weak enforcement of regulations. Opportunities thus arise by providing support to the Ministry of Environment in establishing guidelines that set criteria of evaluating projects that contribute to achieving CE. It is further important to share these guidelines with the relevant ministries, such as the Ministry of Planning, which accepts projects that should be financed from the country's budget or from the Sovereign Fund of Egypt • Supporting financing institutions and building their capacities in establishing CE -related investment funds and programmes, through building on the new intergovernmental Green bonds that supports financing of investments in climate and environmental projects

4.4 Trade and investments in CE

The EU is a crucial trading partner and investor for Egypt, having accounted for more than 62% of total inward Foreign Direct Investments (FDI) flows in the Financial Year (FY) 2015/2016. There are currently 22 bilateral investment treaties (BITs) signed between Egypt and most of the EU countries. Apart from the EU, member states including France, the Netherlands, Germany and Spain have been the most important sources of FDI for Egypt. However, these FDIs are in most cases directed towards the oil sector, which attracts more than 58% of total inward FDI flows, followed by services (10%) and construction (6%). Regarding Egyptian exports, negotiations between Egypt and the EU are currently ongoing on the Agreement on Conformity Assessment and Acceptance (ACAA) in priority industrial sectors, covering construction products, electrical appliances, pressure equipment, medical devices and gas appliances.

In line with Egypt's introduction of its SDS 2030, the EU inaugurated the Trade and Domestic Market Enhancement Programme in 2016. The program aims to provide support in fostering enterprise development and trade between the EU and Egypt. According to the Egyptian Ministry of Trade, the program aims to spread best practices and to exchange expertise while supporting the Ministry's efforts to enhance the domestic and global competitiveness of the Egyptian industries⁶⁴. With the exception of a number of products (including wool, cotton, hides and skins as well as various oils), imports into the EU of products originating from Egypt are allowed duty-free access since the establishment of a free trade area in January 2019. These refer to chapters 25 to 97 of the Harmonised System (HS) and products include products such as copper cables and wires, textiles and fabrics, various electronic devices, paper and many more⁶⁵.

The export of European post-consumer products or "waste" to Egypt in order to recover valuable resources from the product emerged as an important trade movement between the areas in the context of environmental goods and services. To prevent large-scale waste shipments to Egypt, issuing the import of various types of waste to Egypt has become a complicated and lengthy process. Some materials need to be accompanied by an official certificate issued by governmental agencies or auditing companies in the exporting country stating that the consignments are free of explosives or hazardous materials or need approval of the Head of Egyptian Environment Affairs Agency (EEAA). However, since 2007, a special regulation between the EU and several non-OECD countries, including Egypt, addresses the export of so-called "green listed waste". These materials may be imported and exported without the need for prior written notification and consent of the EAA under the conditions that they are transported to the country in order to recover valuable resources from the waste⁶⁶ ⁶⁷. Egypt was among the top three non-OECD destinations for EU exports of non-hazardous waste in 2014. This means 4% of the overall exported non-hazardous waste coming from European countries found its way to Egypt according to statistics by the European Commission⁶⁸.

Apart from the trade with waste, there are few trade relationships of Egyptian companies exporting environmental goods and services into the EU. The company BariQ, for instance, claims to be the first manufacturer of recycled polyethylene terephthalate (rPET) pellets in Egypt and caters to an international market mainly in Europe and the US with pellets from recycled post-consumer plastic bottles, which are then used for creating bottles and food containers as well as textile fibres⁶⁹.

Moreover, there are some local companies in Egypt in the textiles sector working on regenerated yarn and export to the EU such as ALMATEX, which exports regenerated yarn to customers in Italy, France, Spain, Germany, Portugal, and Latvia. Furthermore, the Waste Marche initiative (see Annex 3) has been approached by European companies in Italy, Poland, and Germany to explore the trade industrial wastes, however, administrative obstacles due to the COVID-19 situation hindered these opportunities.

⁶⁴ http://eeas.europa.eu/archives/delegations/egypt/press_corner/all_news/news/2016/20160211_en.pdf

⁶⁵ <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/WT/TPR/S367R1.pdf>

⁶⁶ https://www.impel.eu/wp-content/uploads/2016/12/guideline-Greenlistet-waste_120316.pdf

⁶⁷ <https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32007R1418&from=DE>

⁶⁸ <https://ec.europa.eu/trade/import-and-export-rules/export-from-eu/waste-shipment/>

⁶⁹ <https://www.bariq-eg.com/about-us/>

Table 4-5 Opportunities for an Egypt -EU trade and investment cooperation on CE

Opportunities for Egypt-EU cooperation on CE
<ul style="list-style-type: none"> • Trade of CE-related environmental goods and services has not yet been in the centre of attention for the EU and Egypt. Imports of wastewater treatment and solid waste treatment technologies account for the largest import volume in Egypt. Paired with growing shipments of non-hazardous waste from the EU to Egypt, this highlights the potential for advancing trade of CE-related goods and services, such as recycling technologies for plastic and rubber waste. Notably, the revision of the EU's Waste Shipment Regulation (WSR) seeks to promote adding value to waste in the EU. • In this context, the staff working document on the evaluation of the Waste shipment regulation highlighting the importance of smooth cross-border circulation of waste, and of ensuring the interoperability of electronic systems for notifications of waste shipments with neighbouring countries provides an important opportunity for the EU and becomes increasingly important in times of COVID-19⁷⁰. However, it should also be highlighted that the revision of the WSR is still in its early stages (collection of feedback on the inception impact assessment was closed on April 8th 2020) and it is therefore impossible to fully assess how it will affect trade relations in terms of CE-related environmental goods and services between Egypt and the EU. • Egypt currently lacks a regulatory framework for the traceability of imported wastes. Such a framework could help to avoid using wastes as second-hand products instead of recycling, which may cause further deterioration to the market conditions. In this context, the EU could support the Egyptian Ministry of Environment in developing and enforcing a regulatory framework for the traceability of imported wastes • Increased waste recycling and reuse in Egypt might be achieved by extending the cooperation with online industrial waste exchange platforms such as the Industrial Waste Management & SME Entrepreneurship HUB (IWEX by ENCPC) and Waste Marche. Supporting these platforms, for instance, by providing technical support, could help to link traders and promote circular trade in. • Opportunities also exist with respect to Enhanced Producer Responsibility (EPR) schemes for equipment/goods traded between Egypt and the EU, especially since EPR is already listed as a central element in the new Egyptian waste law

4.5 EU companies with circular operations in Egypt

Following the increasing economic integration between Egypt and the EU, various companies from European countries and Member States have established themselves on the Egyptian market. Following their multinational standards and guidelines, many of these companies tend to implement measures that achieve CE objectives. However, these activities are not always categorized as CE measures. Furthermore, the level of awareness on sustainability practices in such companies is, due to the exposure and competition in the international markets, usually quite high.

Amandus Kahl is a German-based manufacturer of different plants concerning the conditioning of e.g. biomass, wood, straw, tyres, sewage sludge, plastics scrap as well as domestic and industrial waste. Among others, one focus area is the disposal and recycling industry where Kahl applies their manufactured presses for the compression of wood, straw, agricultural waste as well as paper, plastic,

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https://ec.europa.eu/environment/waste/shipments/pdf/SWD_2020_26_F1_SWD_EVALUATION_EN_V4_P1_1064541.pdf

household and industrial waste into pellets. Together with an office in Jordan, the Giza-based office which opened in 1980 represents the company in the Middle East⁷¹.

Acconia agua, a company based in Spain is strongly engaged in water treatment in Egypt. The company secured a EUR 120 million contract to install their water treatment systems in various Egyptian regions. Six water or wastewater treatment plants are now operating around Cairo with more projects in progress in Abnoub & el Fath as well as Kattameya⁷². Acconia was part of a consortium of companies that contributed to establishing the Gabal El Asfar wastewater treatment plant the largest WWTP in Africa and Middle East and the third largest in the world. After the plants' extension will be inaugurated the facility has a treatment capacity of 2.5 million cubic meters of wastewater per day. For the extension of the Gabal El Asfar, Dutch company **Landustrie** supplied several pumps and sludge pumping stations to enable the processing of 9000 m3 of water per hour.

Energic Plus is a company based in Belgium that is mainly active in the energy storage and power supply sector. Specifically, the company manufactures and offers various industrial battery chargers. Recently, Energic Plus has established a battery regeneration centre in Cairo. This process restores the capacity of used batteries and prolongs their lifespan⁷³.

Geocycle provides industrial, agricultural and municipal waste management services and is based in Switzerland. For instance, the company utilizes existing facilities in the cement industry to resolve waste challenges sustainably. Geocycle Egypt has been instrumental in addressing municipal solid waste management problems in Qaliobiya Governorate. In light of the growing energy crisis that faced industries in Egypt, Geocycle's initiatives aim to cater to the need for alternative solutions while creating a new value chain for the local communities. Geocycle further helps farmers and plantation owners to sustainably manage their agricultural waste⁷⁴.

Ouishare is a France-based organization with a focus on a sharing economy in order to decrease global resource pressure. The organization for instance offers the facilitation of events, research and consulting services on emerging topics and new business models. The Ouishare community in Cairo has been established in September 2016 and has since organized different events in Egypt such as the 3-day zero waste event AltShift2019 with around 230 attendees⁷⁵.

German Beauty and Laundry Care company **Henkel** has committed itself towards circular economy goals and for its achievement has collaborated with the social enterprise Plastic bank since 2017. To increase their share of recycled plastic in their packaging, the company contributes to developing an infrastructure of more than 400 Plastic Bank collection points in Egypt⁷⁶.

The Spanish water management company **FCC Aqualia** offers end-to-end water management services and in 2015 led a consortium of various companies for developing the Abu Rawash wastewater treatment plant in Cairo. Whereas currently it processes 400,000 m3, the plant is currently extended to allow the

⁷¹ <http://akahlarabic.com/site/%D9%86%D8%A8%D8%B0%D9%87-%D8%AA%D8%A7%D8%B1%D9%8A%D8%AE%D9%8A%D8%A9.html>

⁷² <https://www.acconia-agua.com/in-the-world/africa/egypt/>

⁷³ <https://energicplus.com/en/news/new-battery-regeneration-centre-in-egypt>

⁷⁴ <https://www.geocycle.com/egypt-collaboration-informal-sector-management-msw>

⁷⁵ <https://www.altshiftfestival.com/>

⁷⁶ <https://www.henkel.co.uk/press-media/press-releases-and-kits/2019-11-13-henkel-extends-partnership-with-plastic-bank-998398>

processing of 1.6 million m³ per day, servicing 5.5 million people living in Giza, making it the second largest operating plant in Egypt and one of the largest in the world⁷⁷.

There was an output of SWITCH-MED project entitled “Eco-innovation promotion and partnerships” that aimed at creating **B2B opportunities** between EU eco Innovative service/technology providers and Egyptian industrial plants. One of the success stories was the B2B opportunity that was developed between “**Jeanologia**” (Spanish technology provider for manufacturing of equipment for finishing textiles and readymade garments) and an Egyptian textile company EMESSA, where they made an agreement with a textile facility in Egypt to upgrade the bleaching technology of jeans and resulted in water, energy and materials savings. The project required an investment of 600,000 Euros and achieved net savings of 675,000 m³/month

LafargeHolcim and Heidelberg cement producers, adopt and promote CE practices through the use of biomass residues and refuse derived fuel as partial substitutes to fossil fuels in the clinker production process. Yet, there is still more room to adopt further CE measures in these companies, for example, promoting the recycling of by-pass dust to be used as a secondary raw material in road construction activities, and applying waste heat recovery techniques.

Table 4-6 Opportunities and barriers for creating a supportive CE environment for EU companies in Egypt

Opportunities & Barriers for creating a supportive environment for EU companies with CE-operations in Egypt
<ul style="list-style-type: none"> • The Confederation of Egyptian European Business Associations (CEEBA) was established in 2007 with the aim of creating “one powerful national pan European network to advocate on behalf of Egyptian Business for market access to the EU and to promote EU Egyptian Trade and Investment CEEBA executes visibility activities and support to EuroMed and ENP processes and supports capacity building of economic operators (EU-Egypt Bilateral Chambers)”. CEEBA could facilitate business-to-business opportunities that foster CE cooperation between Egypt and the EU, given their strong network with industrial stakeholders and governmental institutions in Egypt. • The Environmental Compliance Office of the Federation of Egyptian Industries (ECO-FEI) promotes environmental investments among industrial facilities and supports in the creation of investment opportunities. Working with ECO-FEI could also facilitate CE cooperation between Egypt and EU companies. • The Egyptian National Cleaner Production Centre (affiliated to the Egyptian Ministry of Industry) promotes the transition for clean and innovative technologies and resource efficiency & cleaner production methods among industrial facilities. They have been leading entity in the MED TESTII Project in Egypt. They can also play an important role in advancing cooperation between Egypt and EU companies on CE cooperation. • Additional awareness raising among industrial facilities in Egypt on both CE and green financing opportunities (e.g. Mostadam platform in Egypt promotes sustainable finance, and was founded by the UNDP, Egyptian Corporate Responsibility Centre and Arab African International Bank) is necessary to create business opportunities with the industrial sector, since they need to have good understanding on the CE subject. • EU companies with established CE operations in Egypt predominantly engage in municipal solid waste management (especially plastics), wastewater treatment as well as, to some extent, agriculture. However, the EU has so far provided little direct support in establishing business-to-business relations in the context of CE, e.g. by organising matchmaking events. So far, Egypt is considered as a potential candidate for the EU’s

⁷⁷ <https://www.afrik21.africa/en/egypt-government-controls-extension-of-abu-rawash-wastewater-treatment-plant/>

Circular Economy Mission in 2021. This will offer valuable opportunities for deepening b2b relations between Egyptian and European companies.

4.6 Research and technical cooperation

The foundation for cooperation in research, science and technology is set by the “EC-Egypt Agreement for Scientific and Technological Cooperation, Road Map”, which was signed in 2005 and has been in implementation from 2008 onwards. The cooperation agreement, a direct result of longstanding research collaboration between the EU and Egypt, set the basis for further bilateral efforts in the fields of research and technical cooperation.

Already a year after the signature of the agreement, over 71 projects were conducted in partnership with EU institutions and a total of EUR 6.6 million were granted to the participants of the projects. These grants were provided as part of the Sixth Framework Programme (FP6), a predecessor of the Horizon 2020 project, with “application-oriented” research projects.⁷⁸ Under another EU programme, the Research, Development and Innovation programme an additional EUR 6 million were given to an EU/Egypt Innovation fund. The cooperation agreement also laid ground for future collaboration, as a network of focal points was established that would provide further means of disseminating information in Egyptian universities, research institutes and technology centres.

Intensified efforts of cooperation across the sectors in research and innovation, advancing ICT system, were declared one of the main priorities in the EU-Egypt Partnership Priorities (PPs). For this purpose, the EU and Egypt foresee increased exchange within the frameworks of the innovation programme Horizon 2020 and Erasmus+⁷⁹. Since Horizon 2020 is the primary strategic RDI cooperation initiative of the EU, it is also the basis of many smaller supplementary RDI projects. Up until December 2018, 36 Egyptian organisations have participated within the Horizon 2020 programme and 105 Egyptian researchers have been granted training and mobility under the Marie Skłodowska-Curie programme, a programme affiliated with Horizon 2020. Egypt is also an active member in the EuroMediterranean Group of Senior Officials in Research and Innovation (EU-MED GSO), which enables them to monitor and formulate the EU’s research priorities with the non-EU Mediterranean countries. The EU and Egypt also co-chaired the 4th EU-African Union High Level Policy Dialogue on Science, Technology and Innovation in 2017 in Brussels, which further demonstrates the commitment to cooperation.⁸⁰

A cornerstone of EU-Egypt RDI cooperation is the recently agreed upon participation by Egypt in the Partnership for Research and Innovation in the Mediterranean Area (PRIMA). The agreement, which entered into force in 2018 in Egypt, strengthens collaborative scientific efforts in the selected research fields of the PRIMA initiative. This includes the development of solutions for a more sustainable management of water and agricultural production⁸¹. The ten-year initiative, which is partly funded by the Horizon 2020 programme, aims to develop new research and innovation approaches to address the water scarcity issues in Egypt experienced in the urban and agricultural sectors⁸².

Thematically placed in a similar category, the WaterWorks projects have also led to a RDI exchange between European and Egyptian institutions on CE-related topics. WaterWorks are a series of project initiated by the Water Joint Programming Initiatives and aim to address important societal challenges,

⁷⁸ https://ec.europa.eu/growth/sectors/space/research/fp6_en

⁷⁹ <https://www.consilium.europa.eu/media/23942/eu-egypt.pdf>

⁸⁰ https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/report_on_eu-egypt_relations_in_the_framework_of_the_revised_enp.pdf

⁸¹ <https://www.era-learn.eu/network-information/networks/prima>

⁸² https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/report_on_eu-egypt_relations_in_the_framework_of_the_revised_enp.pdf

which cannot solely be addressed by individual countries.⁸³ The latest instalment WaterWorks2017 includes a research project on sustainable water management and has the Ain Shams University listed as project partner⁸⁴.

Following a meeting of the EuroMediterranean Group of Senior Officials in Research and Innovation in November 2017 in Brussels, Egypt declared their membership in the Strategic Research Marine and Maritime Research and Innovation Agenda for Blue Growth (BLUEMED) working group. BLUEMED is another RDI initiative, which addresses CE-related issues in the Mediterranean Region. Although Egypt is not a signatory of BLUEMED, the BLUEMED agenda is endorsed by the Union for the Mediterranean and as such Non-EU countries are invited to join the initiative. First discussions on possible collaborations under the BLUEMED initiative were held during consultation sessions with Egyptian partners in Alexandria on July 16th, 2018. BLUEMED is most likely the origin for the most extensive research actions on CE in Egypt, which is indicated in the “Mapping of initiatives - National Hubs Egypt” publication. Amongst the listed research actions are project that promote the research of innovative technologies (conversion of plastic into fuel, use of biodegradable materials in maritime industries, use of jelly fish medusa to produce micro plastics filters)⁸⁵.

Summarizing the research landscape shared between the EU and Egypt, CE does not yet form an explicit part of joint scientific undertakings. The table below includes a list of the CE-related research projects that were conducted under the mentioned EU research initiatives.

Table 4-7 CE-related research projects that were conducted under EU research initiatives

CE Related Research Projects	Partnering Research Institution	Research Initiative	
Strategies for increasing the water use efficiency of semi-arid Mediterranean agrosilvopastoral systems under climate change	Irrigation and Hydraulics Dept., Faculty of Engineering, Ain Shams University;	WaterWorks2015	Source
Improvement of water and nutrient retention and use efficiency in arable farming systems from field to catchment scale in Europe and North Africa	National Authority for Remote Sensing and Space Sciences,	WaterWorks2017	Source
BrasExplor: Wide exploration of genetic diversity in Brassica species for sustainable crop production	Institut de Génétique Environnement et Protection des Plantes, IGEPP; France	PRIMA 2019 Call Section 2	Source
EADANMBRT: Evaluation and development of anaerobic membrane bioreactor (AnMBR) technology to promote unrestricted wastewater reuse and mitigate compromised surface	Lebanese American University, LAU; Lebanon	PRIMA 2019 Call Section 2	Source

⁸³ <http://www.waterjpi.eu/about-us>

⁸⁴ <https://www.era-learn.eu/network-information/networks/waterworks2017/water-jpi-2018-joint-call-closing-the-water-cycle-gap/strategies-for-increasing-the-water-use-efficiency-of-semi-arid-mediterranean-agrosilvopastoral-systems-under-climate-change?SearchTerm=egypt>

⁸⁵ <http://www.bluedmed-initiative.eu/wp-content/uploads/2019/11/Pilot-hubs-Egypt.pdf>

CE Related Research Projects	Partnering Research Institution	Research Initiative	
water quality in the Mediterranean region			
Fish-PhotoCAT: Photocatalytic water remediation for sustainable fish farming	Università degli Studi di Milano, UML; Italy	PRIMA 2019 Call Section 2	Source
SMARTIES: Real time smart irrigation management at multiple stakeholders' levels	Politecnico di Milano, POLIMI; Italy	PRIMA 2019 Call Section 2	
AZMUD: Improvement of Mediterranean greenhouses performance using innovative plastic materials, natural additives and novelty irrigation technologies.	AIMPLAS Plastics Technology Centre; Spain	PRIMA 2019 Call Section 1	Source
HortiMED: Towards circular horticulture: closing the loop on Mediterranean greenhouses	Inkoa Sistemas S.L.; Spain	PRIMA 2019 Call Section 1	Source
SIGMA-Nexus: Sustainable Innovation and Governance in the Mediterranean Area for the WEF Nexus	Technical University of Munich; Germany	PRIMA 2019 Call Section 1	Source
Development of behaviours compatible with environmental sustainability and waste reduction, efficiency of the waste collection chain, safely collection and handling of marine plastics, the separated collection and the recycling	Ministry of Higher Education and Scientific Research MHESR, Ministry of Education, Egyptian Environmental Authority Affair (EEAA), Universities of Alexandria and Suez Canal, National Institute of Oceanography and Fisheries NIOF, bibliotheca Alexandria	BLUEMED	Source
Using organic crustacean shells to reduce the propylene usage.	Marine science department Suez Canal University.	BLUEMED	Source
Plastic mapping at coastal regions	NIOF, Faculty of Science Alexandria University.	BLUEMED	Source
Using Jelly fish medusa as raw material to produce micro-plastics filter for commercial and public use as a solution to plastic pollution.	Marine science department, Suez Canal University.	BLUEMED	Source
Collection, sorting and valorisation of plastics at recycling factories.	EEAA, NIOF, Governorate	BLUEMED	Source
Conversion of plastic into fuel	Petroleum research Institute, NIOF	BLUEMED	Source
Using biodegradable materials at fishing gears industries	Suez Canal university.	BLUEMED	Source

Local research on CE related topics is not well introduced among local universities and research centres. Universities can play an important role in the research and the technical cooperation on CE between Egypt and the EU, since collaboration between industries and researchers can assist in identifying and

validating CE-relating opportunities which can be further exchanged between the 2 parties, which is currently lacking.

The following universities/research institutes can provide a valuable contribution to future CE-related research and technical cooperation:

- Ain shams university-Centre of excellence in waste management;
- Cairo University - Centre of excellence;
- Zewail University;
- Nile university;
- The American university in Cairo -Environmental Engineering Program;
- Heliopolis university (focuses on waste topics);
- Universities in regional centres (e.g. excellence centre in Assiut governorate);
- National research centre;
- Egyptian National Cleaner Production Centre - Affiliated to the Egyptian Ministry of Industry.

The EU can provide support to the local research on CE related topics in such institutions, with a particular focus on advanced circular economy measures; how to adopt them and how to link them to the national circumstances to achieve results that align with priorities of the country. This is because transformational transition to CE should effectively start from university level graduates and post graduate researchers.

As mentioned previously, GIZ is planning to start education training program with 3 local universities on solid waste management topics; where the GIZ will introduce new courses on state-of-the-art technologies and business models, with CE being leading principle in it.

Furthermore, interviews with stakeholders revealed that there is a need for further technical cooperation and building of technical capacities on the implementation on the adoption and implementation of CE measures. Moreover, Horizon Europe's mission areas (climate change adaptation/societal transformation; healthy oceans and inland waters; climate-neutral/smart cities; and soil health and food) are uniquely placed to cater to the most pressing needs of the Egyptian transition to CE.

Table 4-8 Opportunities and barriers for CE related research and technical cooperation

Opportunities and barriers for CE-related research and technical cooperation between the EU and Egypt
<ul style="list-style-type: none"> • Summarizing the scientific landscape shared between the EU and Egypt, CE does not yet form an explicit part of joint research undertakings. Given that Horizon 2020 has been the primary vehicle for strategic RDI cooperation between Egypt and the EU, encouraging Egyptian institutions in engaging in the follow-up research and innovation programme (Horizon Europe, 2021-2027) offers important opportunities to drive the transition towards CE in Egypt and Europe. • Notably, four of Horizon Europe's mission areas (climate change adaptation/societal transformation; healthy oceans and inland waters; climate-neutral/smart cities; and soil health and food) are uniquely placed to cater to the most pressing needs of the Egyptian transition to CE.

5 Recommendations

Throughout the report, we tried to provide an overview on the status of CE in Egypt in the sectors which do represent priority sectors in the Egyptian policy context and that also coincide with the CE priorities in the EU Circular Economy Action Plan.

5.1 General findings and recommendations

It can be concluded that there are existing national efforts that support the circular economy in Egypt, however, these efforts are not being realized under a CE heading. This is due to the fact that circular economy as a concept is not dealt with separately, but is embedded in the Sustainable Development Strategy SDS 2030, Green economy strategy, and the National SCP action plan, with focus on applying CE measures in the waste sector, reduction in energy, materials and water consumption and using secondary raw material in the industrial production process. Such strategies are not enough to support the transition towards CE in Egypt; however, they could act as a starting point for the development of a framework strategy on circular economy with clear priorities, implementation plan and investment plan, with further coordination and mainstreaming of circular economy between ministries and relevant stakeholders.

Transitioning to circular economy in Egypt shall be foreseen as a tool to create new job opportunities, develop industries, address waste management issues, and foster sustainable economic growth. However, the current situation of CE reveals that there is a lack of technical knowledge, standards, and roadmaps that support the transition to CE in Egypt.

The Egyptian Ministry of Environment is taking steps to further incorporate CE in national regulations, with the new waste law that addresses circular economy in waste management. Nevertheless, further regulatory frameworks need to be in place to support transition to CE in Egypt as shown in chapter 4.

Also, there are several nationally driven financial programmes and initiatives that support circular economy in industry, waste, tourism, and agriculture sectors. Such programmes/initiatives could be used as a starting point to further scale up CE related measures in these sectors.

As a starting point, raising awareness and building capacities on CE among private and public sectors is a necessary step to further advance CE cooperation between Egypt and EU. Such awareness shall include transfer of technical knowledge on CE measures, support in establishing CE business models and successful business cases in CE, further support to MSMEs, awareness and capacity building among financing institutions in Egypt and awareness among relevant stakeholders; such as relevant ministries and private sector initiatives. Involvement with universities and technical institutions will also foster collaboration on research activities related to circular economy.

Furthermore, a national entity in Egypt must take the lead in facilitating the transition of CE among different sectors. Such entity has to be supported by the Ministry of Environment, Ministry of Industry and other relevant ministries to the CE transition (such as ministry of agriculture, ministry of tourism etc. as well as ministries of finance and planning). ECO-FEI and ENCPC could be considered as candidate entities for such initiative.

There are also several development cooperation programmes that could facilitate the promotion of CE in Egypt, given their long-standing history in Egypt and successful results in achieving tangible results in different topics related to resources efficiency, such as those implemented by UNIDO (IEE program) and UNEP (SWITCH-MED Programme). Interviews with representatives from these development cooperation programmes revealed that they welcome cooperation with the EU on the introduction and promotion of CE in Egypt. Additionally, one of the very active organizations in Egypt that acted as a very strong entry point during the preparation of the National SCP as a part of the SWITCH-MED project was the Centre for Environment and Development for the Arab Region and Europe (CEDARE). CEDARE has long-standing relations with the ministry of environment in Egypt and could act as an entry point to promote CE in Egypt.

A specific recommendation to elaborate further on the 3 overarching Partnership Priorities (PPs) - which form a strategic framework for the political engagement and cooperation between the EU and Egypt - is the creation of a focal point (or small unit) within the Egyptian administration, dedicated to develop sustainable goals and as such also the circular economy agenda, hand in hand with the delegation of the EU. To ensure CE is reflected in upcoming new political CE is reflected in upcoming new political (PPs) and development cooperation priorities, the policy dialogue on CE should be aligned with the common EU-Egypt objectives in this area and the national circumstances and priorities of the Egyptian government (e.g. possible inclusion of renewable energy/energy efficiency improvement projects and wastewater recycling projects in CE policy dialogues, since they represent high priority to the government).

CEEBA can also play an important role in exploring business to business opportunities related to CE in the policy dialogues. CEEBA should be one of the key stakeholders to develop the agenda of a new Circular Economy Mission (CEM) between the EU and Egypt.

Furthermore, the GIZ's work on the NSWMP of Egypt gives it an advantageous experience to further enlarge their scope of activities to include CE measures. KfW, EIB, EBRD and AfD also have long-standing history of successful cooperation in environmental and development related projects in Egypt, and similar to GIZ, could further expand their scope to facilitate transitioning towards CE in Egypt.

A very important aspect that has been identified by all the interviewed stakeholders in Egypt is the need for implementation of pilot cases on CE-related projects, as cooperation should not be only supporting the development of frameworks and strategies. Also, it is important to ensure the sustainability of the outcomes of the cooperation projects, by creating an exit strategy that sustains the outcomes of the project after the end of the programme timeline. Furthermore, involved stakeholders in CE-related projects will only be committed if they feel that there will be real tangible results that have positive financial, social and environmental impacts. This should go hand in hand with the increase of monitoring and evidence collection of the economic, social and environmental outcomes of these pilot cases with the aim to collect information for potential upscaling and advocacy.

Opportunities that could be explored in the field of CE could broadly include the following:

- Working both at policy level (encouraging development of strategies/frameworks) and at supporting concrete pilot CE-cases, since pilot cases with tangible results will encourage the involved stakeholders in pursuing CE-related projects;

- Preparing exit strategies to ensure sustainability of supported pilots. There are different forms of universal exit strategies that could be approached. “Phasing Over” exit strategy would seem the most practical, where the development programme/project will transfer the activities to local institutions or communities, and capacity building to the local institutions takes place during the project implementation, to ensure the continuity of the services provided by the project through local structures after the exit of the development programme/project;
- Investing in Monitoring & Evaluation systems to collect evidence on the impact of implementing CE projects (environmental, financial, and social aspects), to inform upscaling of future CE activities;
- Providing support to the Egyptian government and private sector on raising awareness on CE concepts and latest technologies;
- Business to business opportunities in projects in the field of CE (e.g. e-waste management, trade in environmental goods (scrap metals, plastics), industrial waste exchange through existing online platforms.);
- Improving the sector’s performance in relation to CE by introducing latest concepts/technologies that reduce primary resources consumption (e.g. recycling in the textiles industry, construction materials industry);
- Supporting the Egyptian government in the development of a framework strategy with a clear implementation and investment plan on CE;
- It is recommended to start with one of the sectors mentioned below, and build a successful case out of it, to be further replicated in other sectors. To facilitate the process, it is recommended to start with a sector that has strong database in terms of resources consumption and waste generation, clear value chain, strong key players, and has existing policies/strategies and a regulatory framework that can further support the sectors’ scale up to adopt CE measures. Interviews with Egyptian stakeholders revealed that textiles, agri-food industry and iron and steel industries are sectors with very good potential to start with;
- Although energy efficiency and renewable energy measures are not considered under the definition of CE in the context of this report, it is however advisable to include energy efficiency and renewable energy measures, since they represent high priority to the Egyptian government, especially after the energy crisis in Egypt that took place between 2013 - 2015, and a large portion of European FDIs is directed to renewable energy projects in Egypt. Also, there are clear links between CE and EE that can be established, since keeping resources longer in the value chain can also save energy consumption.

5.2 Sector specific recommendations

In the following table, we have matched the EU’s CE actions and plans with the priority sectors identified by the Egyptian government and the areas of collaboration.

Table 5-1 Relation between EU’s CE actions and Egyptian CE priorities

Sector/subsector	Priority to the Egyptian Government	Priority to the EU	Further Opportunities could be explored
ICT & electronics	Through the Egyptian Green ICT Strategy Initiative	Circular economy action plan and Circular Electronics	– Providing support to the Egyptian government on raising awareness on green ICT

Sector/subsector	Priority to the Egyptian Government	Priority to the EU	Further Opportunities could be explored
		Initiative'	<ul style="list-style-type: none"> – Capacity building in the field of environmentally friendly ICT systems – Implementing projects in the field of e-waste recycling which could further foster the trade of e-waste for recycling purposes and creating B2B opportunities between EU companies and Egyptian companies in the field of e-waste recycling
Plastics	Through the industry and Trade Development Strategy 2016 - 2020 and the new waste law	Circular economy action plan and EU Strategy for Plastics in the Circular Economy	<ul style="list-style-type: none"> – Investment in the plastics sector to upgrade and increase further CE practices in the plastics industry sector – Technology transfer of the latest concepts of bio-based and biodegradable plastics – Provide capacity building on most recent concepts/technologies in the plastics recycling industry – B2B opportunities between EU companies and national companies on latest plastics recycling techniques – Trade in environmental goods and services
Construction and buildings	Through the industry and Trade Development Strategy 2016 - 2020 Sustainable and Green growth strategy for Egypt	Circular economy action plan and	<ul style="list-style-type: none"> – Introducing CE concepts in the construction materials industry (e.g. in cement, steel, bricks) that include utilization of secondary raw materials, and alternative fuels, minimization of wastes and improving recycling activities – Transfer of know-how on the latest concepts of construction waste minimization and recycling – Transfer of know-how on resources efficiency measures in the construction and buildings sector.
Food production industry	Through the industry and Trade Development Strategy 2016 - 2020. And it shows potential for resource efficiency (water, materials and energy) according to the SWITCH MED project	Circular economy action plan	<ul style="list-style-type: none"> – Introducing latest concepts and technologies to upgrade and increase further CE practices in the food production industry in a manner that minimizes resources consumption and waste generation and improves recycling practices – Provide capacity building and technology transfer on most recent concepts/technologies with regards to CE in the agri-food industry – Agri-food waste has a huge potential to be used as raw material in pharmaceutical industries (e.g. pectin from oranges peels

Sector/subsector	Priority to the Egyptian Government	Priority to the EU	Further Opportunities could be explored
			<p>which is currently being imported although Egypt is among the top 5 countries worldwide in the exports of oranges, lycopin from tomatoes in pharmaceutical industries, citrus products, rice husks to be used in white fumed silica used as thickener in the chemicals industry which is currently being imported).</p> <ul style="list-style-type: none"> – B2B opportunities between EU companies and national companies in the field of agri-food industry
Tourism	Egyptian Ministry of Tourism has also launched its Reform Program in 2018 In addition to the green star hotel certification program Egypt's Sustainable development strategy SDS 2030 addressing tourism sector	Not a priority in CE action plan	<ul style="list-style-type: none"> – Introduction of latest circular economy practices in the tourism sector through capacity building and investments that reduce the consumption of primary resources, minimizes waste generation and improve recycling activities – Sector has been prioritized by the government especially due to the COVID-19 situation, the government is having a priority to bring back tourism, and several opportunities related to CE can arise in the tourism sector. E.g. utilization of biodegradable single plastics – Green tourism unit is setting the utilization of solar water heaters and solar panels for electricity generation as a priority, and they need support in that topic
Agriculture sector	Sustainable Agriculture Development Strategy National biomass framework strategy (currently under development)	Circular economy action plan (Food, water and nutrients)	<ul style="list-style-type: none"> – Introduction of latest sustainable agricultural practices/technologies that lead to reduction in resources consumption (water, chemical fertilizers), improvement of crop yield and minimization of degradation of soil quality and wastes generation – Investments in the production of organic fertilizers and promote its use – Utilization of agricultural wastes as biomass energy sources instead of fossil fuels in different applications
Textiles	Through the industry and Trade Dev. Strategy 2016 - 2020 Targeted sector by the SDS 2030.	Circular economy action plan In addition to being one of the important commodities	<ul style="list-style-type: none"> – Investment in sustainable textile practices that include waste minimization and recycling practices/technologies in textiles sector

Sector/subsector	Priority to the Egyptian Government	Priority to the EU	Further Opportunities could be explored
	Strong direction from the Egyptian government to revitalize this sector. MED-TEST III project will address CE in the textiles sector.	imported from Egypt by the EU	<ul style="list-style-type: none"> – Capacity building and raising awareness on waste minimization and recycling in the textiles sector – B2B opportunities in the CE measures between EU companies and Egyptian national companies that export to Egypt (such as Jeanologia B2B opportunity through MED-TEST II project)

In the following table, we elaborate further on specific recommendations for the aforementioned sectors.

Table 5-2 Key findings and recommendations across different sectors

Sector	Key Findings	Recommendations
Plastics	<p>The consumption of plastics has grown strongly during the last decades and therefore, Egypt is producing almost a million tonnes of plastic waste on an annual basis. A third of this waste is not collected and is therefore likely to end up in the environment with all the associated negative impacts for wildlife. Another third of the plastics in Egypt is landfilled. This means that two thirds of the value of the plastic waste that is generated is lost. As such there is a need to increase the waste collection rate and switch from landfilling to recycling. With regards to plastics recycling, Europe also still has a long way to go.</p> <p>Most of the plastics produced in Egypt use petrochemicals as the main raw material to their industry. Using recycled plastics as input to the plastics industry is much smaller ratio compared to the use of petrochemicals in the manufacture of plastics.</p>	<p>It might be interesting to set up international cooperation platforms for petrochemical industries and circular businesses active in plastics recycling to increase cooperation and exchange best practices. However, it is worth mentioning that one of the major challenges that could face this sector (in relation to circular economy) is the informal waste separation and collection of dry valuable recyclables that include plastic that could have otherwise been used in plastics recycling industry.</p>
Construction and Building	<p>Egypt's population has grown dramatically during the last two decades, from 68.8 million in 2000 to 97.5 million today. This vast growth brings along significant challenges, especially in urban areas, particularly in Cairo where informal neighbourhoods are growing at a high pace.</p>	<ul style="list-style-type: none"> – Focus on construction materials that are low-cost and locally available, such as rammed earth. – Buildings for which higher budgets are available could be built with locally produced sandstone.

Sector	Key Findings	Recommendations
	<p>Due to the strong growth in population, the need for sufficient (affordable) housing has strongly increased as well. The urban sprawl has contributed to a strong increase in cement consumption over the last few decades, but it is questionable whether this trend is sustainable. Building with concrete is relatively expensive and using more circular approaches to building design could lower the costs for the provision of appropriate housing for the growing population, while simultaneously reducing the negative environmental impacts (e.g. CO₂ emissions from cement production) of the construction sector considerably.</p>	<ul style="list-style-type: none"> – Iron and steel sector could be a good candidate sector as well to explore when outreaching industrial sectors in Egypt, since there are several circular measures that are already being implemented in this sector in Egypt (e.g. using secondary raw materials), and it is one of the sectors that has been nominated by the ENCPC given its good existing infrastructure and database that will facilitate data collection, assessment and implementation – This sector has also been prioritized in the sustainable and green growth strategy of Egypt, given its contribution to national GDP (7%) and is responsible for one third of Egypt's GHG emissions.
Agriculture sector	<ul style="list-style-type: none"> – Agriculture is an important sector in the Egyptian Economy but compared to other countries Egyptian agriculture uses vast amounts of mineral fertiliser – Egypt's agricultural production is heavily dependent on irrigation and due to climate change, water stress is expected to increase – The agricultural sector produces substantial amounts of biomass residues. Currently, a large part of these residues is burnt or used as filling material 	<ul style="list-style-type: none"> – Implementation of farming techniques that can reduce fertiliser use, while maintaining yields is an opportunity for Egypt to lower its expenditures on mineral fertiliser, reduce costs for farmers and make more efficient use of scarce resources. – As a net food exporter, EU countries have extensive know-how on agricultural innovation and also on the management of nitrogen inputs. As such, there is an opportunity for the EU and Egypt to intensify cooperation in this area – European countries in the Mediterranean are facing similar challenges and therefore there are opportunities for exchanging best practices and strengthening cooperation in this area as well. – Application of cascading strategies could greatly enhance the value created from the biomass residue streams, e.g. through the production of animal feed. A new bioenergy for Sustainable Rural Development Association has been established a national biomass framework strategy is being developed that includes the use of agricultural wastes as one of the sources to promote biomass energy in promoting sustainable rural development in Egypt, which promotes CE.

Sector	Key Findings	Recommendations
Food processing and manufacturing industry	<ul style="list-style-type: none"> – This sector has been growing continuously due to the increase in production for national consumption and exports – This sector is a priority sector for the government in the Industry and Trade Development Strategy 2016 - 2020, and it shows potential for resource efficiency (water, materials and energy) according to the SWITCH MED project. Participating companies from the food sector identified 141 measures for resources efficiency measures, where 100 of them have been accepted. These measures have a payback of short to medium term, where such measures resulted in water, materials and energy savings 	<ul style="list-style-type: none"> – Agri-food waste has a huge potential to be used as raw material for the production of several products that are currently being imported in Egypt such as pectin which can be manufactured from oranges peels and Egypt is among the top 5 countries worldwide in the exports of oranges. – Rice husks can be used in the production of white fumed silica which is used as thickener in the chemicals industry which is currently being imported. – Agri-food industries need technological support and capacity building in identifying and implementing opportunities that support the CE measures.
Tourism	<p>The tourism sector also provides good opportunities for investment in CE, given the availability of a current program and direction from the Egyptian government, which would facilitate investment in that sector, in addition to the intention of the government to sustainably develop this industry.</p>	<ul style="list-style-type: none"> – Focusing on energy efficiency measures and renewable energy (e.g. solar water heaters and electricity generation using solar cells), in addition to implementing CE measures in the construction/expansion of hotels/resorts with GSH programme. – Supporting “Green Sharm El Sheikh” project, which aims at transforming Sharm El Sheikh city into a “model integrated and ecologically sustainable tourism city of national and international importance through the adoption of low-carbon technologies, good waste management practices and further enhanced protection of its natural capital basis” . Financial support is required for the implementation of the action plan for this project. This could also represent an opportunity for CE to be integrated in Green Sharm El Sheikh Project.
Chemicals	<ul style="list-style-type: none"> – Chemicals sector is also prioritized by the government in the industry strategy – A new waste division in the chemicals industries chamber (Federation of Egyptian industries) has been established, which could also promote CE in the chemicals sector. 	<p>The MED-TEST project demonstrated its potential to reduce the consumption of resources (materials, water, energy) and to avoid waste generation. Further circular economy measures could be examined in the chemicals sector, building on the MED-TEST project</p>

Sector	Key Findings	Recommendations
Water	Water sector is considered a high priority to the Egyptian government and has been mentioned in SDS strategy, the National SCP action plan and several other policies as mentioned in Annex 3, since the country will be facing shortages in water supplies, hence, the government is keen on exploring opportunities that achieve CE in the water sector.	<p>The CE measures in the water sector can be cross-cutting in among other sectors such as agriculture, tourism, agri-food industry, and textiles industry.</p> <p>There is also a supporting regulatory framework for the recycle and reuse of wastewater, which can act as a starting point to support CE transition in the water sector in Egypt.</p>
Textiles	<p>The government is planning to flourish one of its important industries again. The industry and Trade Development Strategy 2016-2020 is planning to establish new industrial city clusters allocated for the textile sector solely; with the aim of developing the textile industry and attracting foreign investments. One of the projects identified by the strategy (project number 1.5: Enhancing the Industrial Competitiveness Project) involves the “development of a specialized program for the enhancement of production methods and knowledge transfer that increases production efficiency, reduces the waste of resources and increases the added value in several sectors that include textile industries”.</p> <p>The government is also setting a vision for the cotton sector that integrates agricultural, commercial, and industrial dimensions of the industry, and focuses on maximizing the utilization of the available resources.</p> <p>The textiles sector was also being targeted by the MED-TEST II project, and the MED-TEST III project will mainly focus on applying circular economy in the textiles sector value chain</p>	<ul style="list-style-type: none"> – Support the textile industry in formulating strategies that adopt circular economy measures to reduce its waste and optimize its materials consumption – The transfer of new recycling technologies and techniques, where secondary raw materials produced from textile waste are reused in the production process. – Fostering circular models into the sales concepts (e.g. clothing rental, resale and upcycling)
Waste (Non-hazardous waste)	<ul style="list-style-type: none"> – The export of European post-consumer products or “waste” to Egypt in order to recover valuable resources from the product emerged as an important trade movement between the areas in 	<ul style="list-style-type: none"> – Increased waste recycling and reuse in Egypt might be achieved by extending the cooperation with online industrial waste exchange platforms such as the Industrial Waste Management & SME Entrepreneurship HUB (IWEX by ENCP) and Waste Marche.

Sector	Key Findings	Recommendations
	<p>the context of environmental goods and services.</p> <ul style="list-style-type: none"> – There are existing online platforms for the exchange of industrial wastes in Egypt – Egypt currently lacks a regulatory framework for the traceability of imported wastes. 	<p>Supporting these platforms, for instance, by providing technical support, could help to link traders and promote circular trade in.</p> <ul style="list-style-type: none"> – In this context, the EU could support the Egyptian Ministry of Environment in developing and enforcing a regulatory framework for the traceability of imported wastes – Opportunities also exist with respect to Enhanced Producer Responsibility (EPR) schemes for equipment/goods traded between Egypt and the EU, especially since EPR is already listed as a central element in the new Egyptian waste law

6 Conclusions

6.1 State of play of circular economy activities

The Egyptian government in general is demonstrating some commitment towards an inclusive, sustainably developed economy, which can be demonstrated in several regulations, policies and strategies that are adopted by the country.

However, circular economy has not been addressed separately as a topic in the national policies and strategies, but its concept has been embedded in the sustainable development strategy of Egypt SDS 2030, sustainable and green growth strategy (as a part of Egypt's Sustainable competitiveness strategy), the National Solid Waste Management Program (NSWMP) and the national sustainable consumption and production action plan. These strategies can act as a starting point for circular economy to further advance in the national context, in a way that creates new job opportunities for lower-income communities especially in rural areas, and provides support the Micro, Small and Medium Enterprises (MSMEs). Still, they are not enough to support the transition towards circular economy.

There are several initiatives and strategies that aim to (indirectly) achieve circular economy objectives in different sectors of the economy such as industry (with a focus on textiles, plastics, agri-food industry and industrial waste exchange), tourism, and agriculture sectors. Nevertheless, given the political and socio-economic situation in Egypt, it is not easy to find enough interest (public and private) in the enforcement of CE, since the Egyptian government is now prioritising strengthening the political and socio-economic stability by reducing unemployment, increasing exchange reserves and reducing the public debt. Furthermore, water resources are being prioritized by the government, especially since water supply from the Nile is slowly decreasing (not taking into account the development of the Grand Ethiopian Renaissance Dam issue). Accordingly, water reuse (already taking place) will become more important in the coming period.

With regards to resources extraction, Egypt's resource extraction has been steadily increasing over the last two decades, where a vast of the resource extraction relates to the extraction of non-metallic minerals (52%), with construction-related minerals accounting for the largest part of the production, in addition to phosphate rock, which is used mostly for the production of mineral fertilisers. However, most of these non-metallic minerals are used for domestic consumption.

With regards to circular economy in manufacturing and services sector, as mentioned previously, industry (textiles, agri-food industry, industrial wastes and plastics), agriculture and tourism sector show a very good potential for CE activities, for several reasons that include their high contribution to the national GDP and labour force, existence of policies and strategies that support their transition to CE with identified opportunities, and their interlinkage with the priorities of the EU's CE action plan.

In terms of end-of-life stage, Egypt's solid waste generation rate reached around 90 million tonnes in 2016; where municipal solid waste and agricultural wastes were the dominant waste streams. Waste sector in Egypt is considered one of the critical sectors where integrated solid waste management in Egypt remains a major challenge. A large share (45%) of households' garbage is dumped onto the street (but informally collected), while 55% is collected by private companies and garbage collectors.

Yet, there is a potential of circular economy activities in the waste sector, as there are several programs and initiatives taking place in the waste sector, that are not necessarily framed under circularity, but have the same approach and lead to similar results. Also, the public sector in Egypt is currently prioritizing the waste sector reform and a new waste law has been approved by the parliament in August 2020, and this law addresses CE in a separate chapter. However, as mentioned previously, the management of waste sector in Egypt is still facing several management issues that need to be resolved.

6.2 Policy framework supporting circular economy activities

The main law that addresses environmental matters in Egypt is the Environmental Law 4 for the year 1994 amended by Law 9 /2009 and law 105/2015, and its executive regulations amended by ministerial decrees No. 1095/2011, 710/ 2012, 964/2015, 618/2017 and finally 1963/2017. The main entity governing the environmental law is the Egyptian Environmental Affairs Agency (EEAA). Waste management in Egypt is majorly regulated under the Environmental Law 4/1994 in addition to public cleanliness law no. 28/1967.

It is worth noting that a new unified law to regulate the management of waste of all kinds has approved by the parliament in August 2020. The new waste law aims to organize, follow-up, control and develop all operations related to waste management, attract and encourage investments in the waste management sector field, ensure the sustainability of the necessary financial resources for the integrated waste management and sets incentives for the investment in the waste management sector. The law also regulates the roles and responsibilities of organizations involved in the integrated waste management system. Above all, the new law addresses circular economy in a whole separate chapter.

6.3 Existing awareness and capacities on circular economy in Egypt

Overall, awareness level on CE in Egypt is still low, where most initiatives do not directly reference CE as an overarching theme but instead address various layers of the waste management hierarchy across various sectors. However, it is increasingly gaining presence among Egyptian business and the industry sectors, where most of this development is happening in the entrepreneurship and start-up levels.

One example on CE-related awareness on the industry level is the Pollution Abatement Programme (EPAP) implemented by the Ministry of Environment that aims at helping industry improve performance and comply with environmental regulations, which touches upon a number of CE-related issues such as resource efficiency, cleaner production and hazardous waste management amongst others. The programme has trained around 1500 candidates including regional managers, factory workers and auditors in the industry sector on resource efficiency, cleaner production and hazardous waste management.

Egypt's National Action Plan for Sustainable Consumption Egypt's highlights the role of capacity building in the context of CE-related activities and acknowledges "the need to make a qualitative shift towards green circular economy as a means to achieve sustainable development". Awareness creation often forms a central part of other CE-related concepts, such as the green economy, sustainable consumption and production and for the most part focus on related (sub-) components of the concept as well as end-of-life/waste management approaches.

Potential barriers for awareness raising in the various industry sectors on CE concepts include the unavailability of specialised training and technical support in many sub-themes of CE and the lack of the enabling environment and enforcing laws/regulations that support CE.

On the consumer level, although Egyptian consumers in general show environmental concern and are resentful about the impact of poor waste management, awareness of CE and CE-related activities are still low. Nevertheless, it is worth noting that consumers in Egypt tend to implement CE practices in general, without labelling it as CE measures, due to the low-income levels and high cost of goods, thus, consumers in Egypt tend to extend the lifetime of their goods by applying repairing, maintenance, and reusing of goods (to the extent possible).

On the education level, universities implicitly address CE-related issues as part of industrial/environmental engineering programmes. One example is Alexandria University, which offers courses on Solid Waste Management and Advanced Wastewater Treatment.

6.4 Impacts and benefits of circular economy in Egypt

The modelling results concluded that transitioning of the economy in Egypt from linear to circular economy would have overall positive economic, social and environment impacts.

In terms of economic benefits, CE activities would have a positive impact on the Egyptian economy by 2030, where Egypt's GDP is expected to be around 1% higher in 2030 in the circular economy scenario compared to the baseline scenario. Most significantly, rising output in key circular economy sectors including agriculture and waste management would generate higher employment in those sectors, leading to higher disposable incomes for consumers, which would be recycled through greater consumption spending on sectors such as financial and business services, education and health, and agriculture. The additional demand resulting from these impacts would lead businesses to increase their expenditure on investment and intermediate production inputs. Furthermore, CE activities would have downstream effects on the trade balance.

In terms of social benefits, CE activities would result in a net increase in employment relative to the baseline scenario of around 0.3% is projected, or approximately 101,000 additional jobs compared to the baseline. The largest employment impacts in the CE scenario would be seen in the agricultural sector, which accounts for over a third of the net employment impacts seen in the modelling results, followed by the waste management sector. Employment in other sectors would benefit indirectly from circular economy activities

6.5 Trade and Investment in CE related goods and services

EU's main imports of goods from Egypt are fuel and mining products, chemicals, textiles and clothing, while the main imports of services consist of travel services and transport. On the other hand, EU's main exports of goods to Egypt are machinery and transport equipment, chemicals, fuels and mining products, and agricultural products, while the main exports of services are business services. Also, the export of European post-consumer products or "waste" to Egypt in order to recover valuable resources from the product is considered an important trade movement between the areas in the context of "environmental goods and services". However, in order to prevent large-scale waste shipments to Egypt, issuing the

import of various types of waste to Egypt has become a complicated and lengthy process. Some materials also need to be accompanied by an official certificate issued by governmental agencies or auditing companies in the exporting country stating that the consignments are free of explosives or hazardous materials or need approval of the Head of Egyptian Environment Affairs Agency to prevent these wastes from reaching the black market.

The government of Egypt has identified targeted sectors for investment that include (but not limited to) agriculture and land reclamation, textiles, tourism, mining, transportation and logistics, real estate, petrochemicals, food processing, oil and gas. These sectors are also cross-cutting with the imports of the EU from Egypt that mostly include fuel and mining products, textiles and clothing and chemicals. Moreover, these sectors provide good opportunities for CE as described in Annexes 2 and 3. Generally, the economic situation in Egypt does not look bad, which should act as a driver for investments in the country, showing improvement in performance in several economic indicators such as the “Ease of doing business” index score which shows that Egypt is performing well.

6.6 EU-Egypt circular economy related cooperation activities

6.6.1 Policy dialogues and development cooperation

The ENP has led to intensified cooperation between the EU and Egypt, and part cooperation discussion is the development of the European Green Deal which places the concept of circular economy at the centre of efforts to transform the European Union into a fair society. Also, the EU-Egypt Association Agreement (AA) was further strengthened through the EU-Egypt Action Plan, which provided a basis for enhanced cooperation and bilateral support in 2007.

Aspects related to CE are discussed as part of the sub-committee on Transport, Energy and Environment, and during cross-cutting cluster meetings on economy and socio-economic development. Also, research and innovation platforms also offer potential for continuous policy dialogues.

For instance, the subcommittee discussed, among other things, recent policy updates including the EU circular/ green economy developments, as well as the Egyptian SDS, national strategy of biodiversity, waste management and transition to a circular economy strategy on the 16th of June 2019.

Such policy dialogues are vital for Egypt’s coordination with donor groups, for instance, projects within the waste sector have led to established policy dialogues between the ministries responsible for implementation and the project-associated donors. Furthermore, the German Embassy has also initiated the “Cairo Climate Talks” at the end of 2011 which recently offered a platform for a variety of CE related topics, such as general waste management, sewage treatment or reduction of plastic waste generation.

Overall, CE has not yet played a major role in policy dialogues between the EU and Egypt yet, however, some exchanges have tackled aspects related to CE in some sectors (e.g. utilisation of wastewater and agricultural residues). The current EU-Egypt AA provides a good basis to incorporate CE in future policy dialogues between the two parties, however enhanced cooperation provisions/commitments would be needed to address common challenges. Moreover, the Egyptian side needs to set clear priorities related to CE, with identified CE priorities, and clearly identified relevant stakeholders to facilitate the cooperation. Finally, the policy dialogue on CE should be aligned with the common EU-Egypt objectives in this field as well as the national circumstances and priorities of the Egyptian government.

6.6.2 Development cooperation projects and programmes, including by the EU Member State

The EU has adopted a Single Support Framework (SSF) that sets priorities and the financial allocation in key strategic areas of bilateral cooperation with Egypt for the period between 2017 and 2020. Accordingly, the EU is supporting various development projects in Egypt through its Switch Mediterranean (SwitchMed) Programme, implemented by the UNIDO, the UN Environment's Economy Division, the UN Environment Mediterranean Action Plan and its Regional Activity Centre for Sustainable Consumption and Production (SCP/RAC). This program aims to create productive, circular and sharing economies in the Mediterranean region.

The second phase of the programme from 2019-2022 (not been officially granted approval to start operating in Egypt yet) has three key components: 1) a regional and national policy component, to support developing and implementing SCP policies; 2) a demonstration activity component, which targets both well-established companies and start-ups to support the adoption of SCP patterns at different stages of business development; 3) a networking component, which connects stakeholders to foster regional exchange and cross-fertilisation.

From 2015 to 2018, the SwitchMed funded a demonstration project "MED TEST II that aimed at Transferring Environmentally Sound Technologies (TEST) by providing direct consultancy services to industries about minimisation of environmental impacts. It was implemented by the ENPC and supported by various other public institutions in Egypt. 28 industries from the chemical, food, and textile sectors were targeted by the MED TEST II project, with profiles ranged from SMEs with 15 employees to large manufacturers. The third phase of MED-TEST III is planned to be launched, focusing on CE in the textiles sector. Another project implemented as part of the SwitchMed project is the development of Green Entrepreneurship project between 2014 and 2018. Circular economy principles formed a cornerstone of this training program.

In the solid waste management sector, the EBRD is currently supporting four projects in the water and sanitation sector and further support is provided by other EU donors.

In conclusion, the donor-funded projects scene in Egypt cover a wide range of environmental issues but seldomly addresses CE as an overarching economic model. Although many projects relate to CE-principles, they are neither incorporated under the umbrella of the CE-terminology and not pursuing integrated circular approaches. Making CE part of into the EU's development cooperation programmes offers the opportunity to establish itself as a front-runner in this area. SWITCHMED programme specifically is uniquely placed for integrating CE more explicitly and strategically into its core activities. It is important to align the development programme related to CE with Egypt's national priorities and circumstances, with the involvement of the ministry of planning and finance, together with the ministry of environment as well as the private sector, especially in the waste management context. There is also a great potential of future development projects lies in the transfer of technology and know-how for the implementation of CE-related projects.

6.6.3 Activities by EIB and other DFIs

The EIB has been active in Egypt since 1979 and has financed 115 projects in Egypt. The EIB and EU are currently in discussions with the Egyptian government on funding projects related to biogas generation from organic wastes such as sludge from sewage treatment plants, animal manure, agricultural waste, and wastes from dairy products industrial facilities. The fund will be in the form of soft loans that will

be facilitated through MSEMDA to business developers working in waste to energy field, or to facilities that generate these types of wastes and aim to develop projects that recycle these wastes.

On the other hand, the EBRD has invested over EUR 2 billion in 36 projects in Egypt, of which 15 projects representing EUR 695 million were part of the so-called Green Economy Transition mandate, which specifically targets projects that contribute to environmental. Besides supporting the transition to renewable energy, last year investment areas of the EBRD covered climate-related projects of SMEs, programmes to address unemployment within the young generation and to raise their skillsets. For instance, the EBRD in collaboration with several Egyptian governmental bodies and the Cement Sustainability Initiative (CSI) of the World Business Council for Sustainable Development (WBCSD) initiated the “Low-Carbon Roadmap for the Egyptian Cement Industry” in 2016. This project discovered several potentials within the cement industry to improve the environmental performance of cement production by applying circular practices.

In terms of activities by other EU-DFIs, it happens that in some cases, several European financing institutes join hands to finance projects of larger volume. For instance, the project “Improved Water and Wastewater Programme (phase I)” received an EU grant of EUR 34 million and additional funding was jointly provided by the KfW, EIB and AFD.

It can be concluded that CE-related aspects have become an increasingly important part of financial cooperation between Egypt and the EU, but CE-financing has not yet become a central pillar of investment cooperation. Various projects signed by EIB and EBRD implicitly promote the transition towards CE in the fields of water management, agriculture, and pollution abatement through a mix of soft loans, grants and blended finance. However, further untackled opportunities still exist in the solid waste management sector, the building and construction sector and the country’s upcoming textile industry. Also, as private sector companies are often unaware of the existing financing mechanisms that could support in the implementation of CE related projects, the support of awareness raising efforts on CE in the public and private sector, as well as mainstreaming CE among key players in the Egyptian Government (such as Ministries of Environment, Finance and Planning) is necessary.

Furthermore, providing support to the Ministry of Environment in establishing guidelines that set criteria of evaluating projects that contribute to achieving CE can be considered as one of the opportunities. Likewise, financing institutions also could receive support by building their capacities in establishing CE related investment funds and programmes.

6.6.4 Trade and investment in CE

EU member states including France, the Netherlands, Germany and Spain have been the most important sources of FDI for Egypt, where most of the FDIs were directed towards the oil sector, followed by services and construction.

Also, as mentioned previously, export of post-consumer/waste products to Egypt is an important trade movement between the areas in the context of environmental goods and services. Also, Egypt was among the top three non-OECD destinations for EU exports of non-hazardous waste in 2014.

However, in relation to CE, the trade of CE-related environmental goods and services has not yet been in the centre of attention for the EU and Egypt. Since shipments of non-hazardous wastes from the EU to

Egypt are growing, this highlights the potential for advancing trade of CE-related goods and services, such as recycling technologies for plastic and rubber waste. Moreover, support can be provided to the Egyptian Ministry of Environment in developing and enforcing a regulatory framework for the traceability of imported wastes to avoid using wastes as second-hand products instead of recycling, which may cause further deterioration to the market conditions. Furthermore, increased waste recycling and reuse in Egypt might be achieved by extending the cooperation with online industrial waste exchange platforms. Also, CE opportunities can exist with respect to Enhanced Producer Responsibility (EPR) schemes given that it is currently forming a central element in the new waste law.

6.6.5 EU companies with CE activities and footprints in Egypt

Several EU companies have established themselves in the Egyptian market, where these companies follow international standards and guidelines. Such guidelines tend to implement measures that achieve CE objectives; however, these measures are not categorized as CE measures. For instance, LafargeHolcim and Heidelberg cement producers, adopt and promote CE practices through the use of biomass residues and refuse derived fuel as partial substitutes to fossil fuels in the clinker production process. However, there is still more room to adopt further CE measures in by promoting the recycling of by-pass dust to be used as a secondary raw material in road construction activities and applying waste heat recovery techniques.

There are several entities that can provide support and facilitate cooperation between Egypt and EU companies on CE matters such as the Environmental Compliance Office of the Federation of Egyptian Industries, the Egyptian National Cleaner Production Centre and Confederation of Egyptian European Business Associations (CEEBA).

Yet, further awareness raising among industrial facilities in Egypt on both CE and green financing opportunities is lacking, and therefore is necessary. Finally, The EU has provided not much direct support in establishing B2B relations in the context of CE.

6.6.6 Research and technical cooperation

The foundation for cooperation in research, science and technology is set by the “EC-Egypt Agreement for Scientific and Technological Cooperation, Road Map”, which was signed in 2005 and has been in implementation from 2008 onwards. Over 71 projects were conducted in partnership with EU institutions and a total of EUR 6.6 million were granted to the participants of the projects with “application-oriented” research projects. Development and Innovation programme an additional EUR 6 million were given to an EU/Egypt Innovation fund. However, CE does not yet form an explicit part of joint research undertakings.

Local research on CE related topics is not well introduced among Egyptian universities and research centres. Universities can play an important role in the research and the technical cooperation on CE between Egypt and the EU, since collaboration between industries and researchers can assist in identifying and validating CE-relating opportunities which can be further exchanged between the 2 parties. There is also a need for further technical cooperation and building of technical capacities on the implementation on the adoption and implementation of CE measures.

The EU can provide support to the local research on CE related topics in such institutions, with a particular focus on advanced circular economy measures, where Horizon Europe’s mission areas (are uniquely placed to cater to the most pressing needs of the Egyptian transition to CE.

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Annex A - List of Interviewed Stakeholders

Name	Organization
Eng. Samah Saleh	Egyptian Ministry of Environment Head of Sustainable development Unit
Eng. Ehab El Hemady	Egyptian Ministry of Environment Advisor to the Minister
Mr. Ahmed Rezk	UNIDO National Programme Officer in Egypt
Dr Ali Abo Senna	Egyptian Ministry of Environment Advisor to the Minister and Director of Bioenergy for Sustainable Rural Development Association (BSRDA)
Dr. Shadia El Shishini	Egyptian Ministry of Industry and Trade Chief Technical Advisor for Egyptian National Cleaner Production Centre (ENCPC)
Eng. Maysara Fouad	Egyptian Ministry of Industry and Trade Head of Resource Efficiency & Cleaner Production and Green Economy Department at Egypt National Cleaner Production Centre (ENCPC)
Eng. Mohamed Sabry	Egyptian Ministry of Industry and Trade Deputy Director & Acting Director at Egypt National Cleaner Production Centre (ENCPC)
Eng. Ahmed Khaled Abo Heneidy	Manager of Green Star Hotel - Eco certification programme Co-founder of Waste Marche project
Ruth Erlbeck	GIZ Cluster coordinator for environment and infrastructure in Egypt, Program Director to the NSWMP
Luc Reuter	UNEP SwitchMed National Policy Coordinator at the United Nations Environment Programme
Eng. Wafaa Ismail	Environmental Compliance Office - Federation of Egyptian Industries
Dr. Mahmoud Ali	Representative of Egypt at ACEN
Dr. Amr Osama Abdel Aziz	Advisor to the Minister of Environment on Climate Change President of INTEGRAL Consult Egypt (Environmental and Sustainability Consulting firm in Egypt)
Eng. Ayman El Zahaby	Technical Expert at UNIDO MED-TEST II project Technical Manager

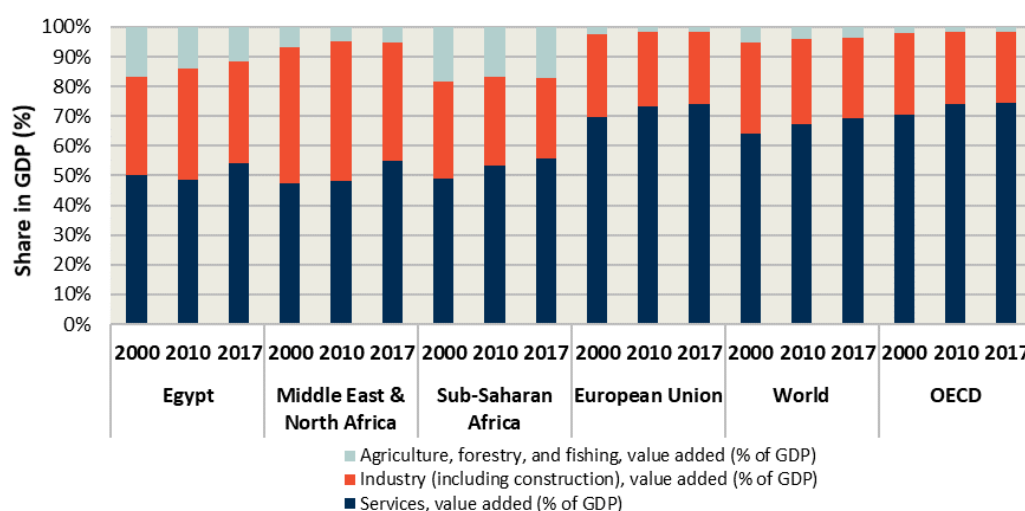
Annex B - Status of the circular economy in Egypt

Economic analysis of CE trends in Egypt (including trade and investments)

Economic structure

There have been several economic reforms during the past decades that aimed at increasing the foreign investments and including several incentives to the private sector. The government of Egypt has also implemented a wave of macro-economic and structural reforms over the past 5 years that helped to stabilize the economy and sustain growth. These reforms included reducing subsidies on energy and fossil fuels, liberalising the exchange rate, reforming the industrial licensing regime and taxes reforms. This can be demonstrated in the GDP that has increased to 5.6% by the end of the financial year of 2019; compared that of 2018 which was 5.3%, coupled with decrease in the unemployment rate to 7.5% in 2019 compared to 9.9% in 2018. However, the social conditions have not improved compared to the macroeconomic improvements, due to the very high inflation rates between years 2016 and 2018 as a result of currency floatation and average wages growth rates falling below the inflation rates; with the share of population living below poverty line increasing to 32.5% in 2018 compared to 27.8% in 2015 (mostly in upper Egypt). In order to mitigate this effect, the government has been designing and scaling up social safety programs, that have also been supported by the World Bank.

Figure B-1 Comparison economic structure Egypt with regional averages

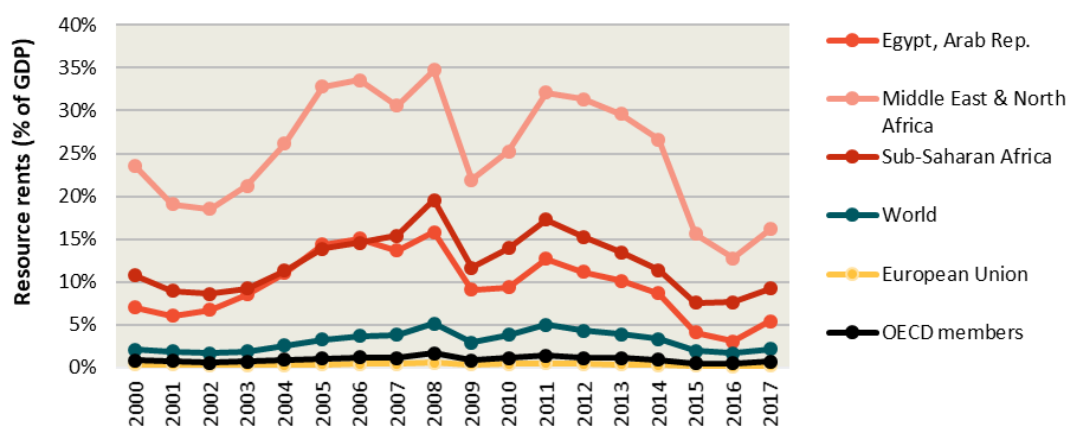


Trends in resource extraction

Egypt is not a very large producer when it comes to metals. The most important metal that is produced in Egypt is gold. In 2017, Egypt produced 17 tonnes of Gold, which is equivalent to approximately 0.5% of the global production.

The extraction and trade in natural resources is an important source of income in the Egyptian economy, and although varying strongly over the years, this accounted on average for around 10% of the GDP during the last two decades. However, this is still lower than in some other countries in the MENA region, especially compared to countries in the Middle East. The world average on the other hand, lies around only 2-5% of GDP.

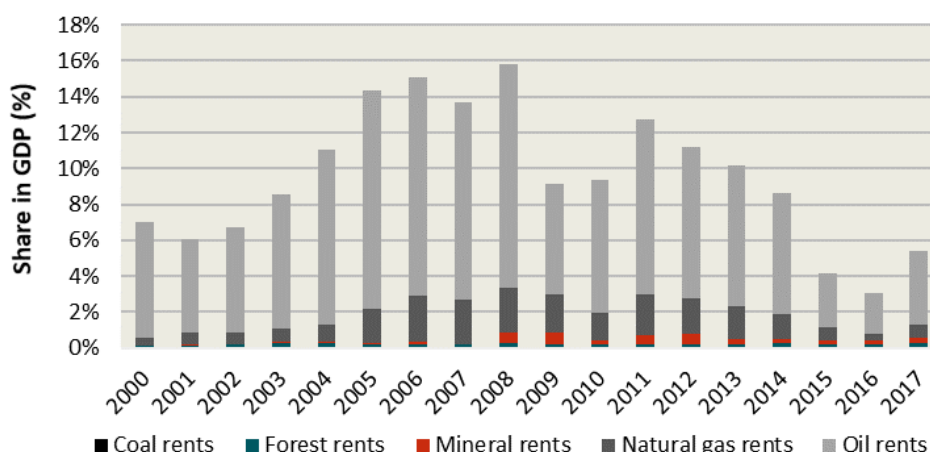
Figure B-2 Resource rents as share of GDP (%) in Egypt compared to regional averages



Source: World Bank - World Development Indicators.

When zooming in a bit more on the resource rents in Egypt, one can see that the lion share of the income derives from the production of oil and to a lesser extent natural gas. During the period 2000-2017, oil contributed for two-thirds to 90% of the resource rents generated in Egypt, although on average its share in the total resource rents has been declining. In 2018, Egypt produced 670 thousand barrels of oil a day, which is equivalent to 0.7% of the global production.⁸⁶

Figure B-3 Resource rents as share of GDP (%) by type of resource

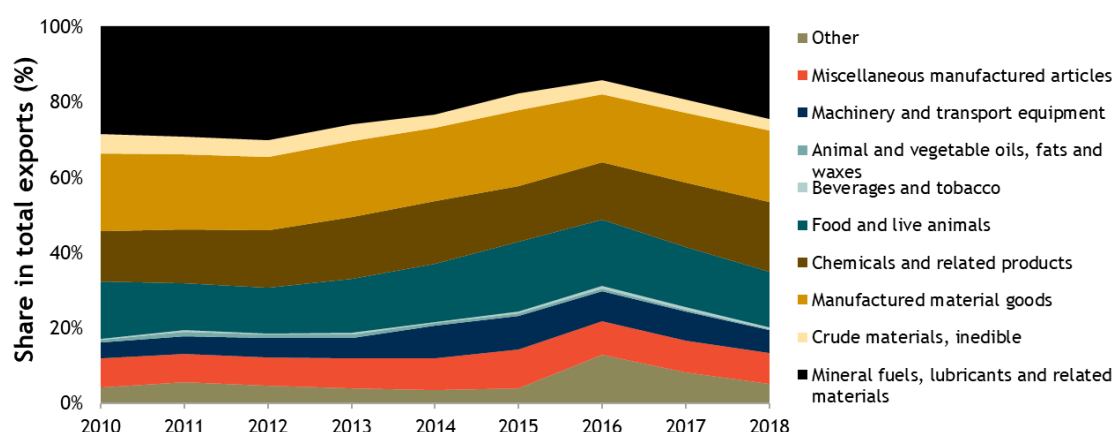


Source: World Bank - World Development Indicators.

The importance of natural resources in the Egyptian economy is also reflected in its trade balance. Almost 60% of the total trade value relates to trade in raw material resources (minerals, ores and fossil resources) or processed materials (e.g. processed metals and chemicals). In the country's exports, raw and processed materials account for more than 60% of the total value. In the exports to the European Union, raw and processed materials accounted for almost three quarters of the total value during the period 2010-2018.

⁸⁶ BP (2019) Statistical review of World energy 2019. <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf>

Figure B-4 the share of different products in total Egyptian exports in the period 2010-2018.



Source - UN Comtrade

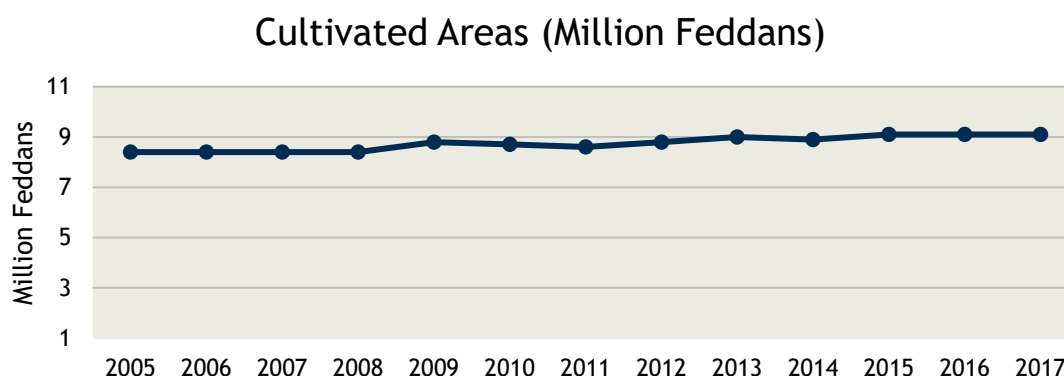
Circular economy in manufacturing and services

Agriculture sector, fisheries, and food production

The agricultural sector in Egypt contributes to around 11.4% of the GDP in 2019, playing a vital role in the Egyptian Economy. The sector provides livelihood for around 55% of the population and employs around 27.5% of the labour force. It consumes around 4.4% from total electricity generated in Egypt. Yet, this sector is dominated by small farms using traditional practices that do not meet international standards. The most important crops grown in Egypt are cereals, fibre crops (mostly Egyptian cotton), sugar crops, food legumes, forage crops. Also fruits such as citrus fruits, grapes, figs, tomatoes and vegetables are broadly grown in Egypt. Despite its broad production of crops, vegetables and fruits, the country did not achieve food self-sufficiency to meet its consumption demands, and this problem will only grow bigger due to the challenges facing this sector that include diminishing agriculture potential and soil quality, water scarcity problems, climate change, deficit on its food balance and rising imports bills.

The country depends heavily on food, fibre and other products from the agriculture sector. The total cultivated area in the period between 2004 and 2017 reached 3.8 million hectares (9.1 million feddans), using around 61.35 billion m³ of water in year 2017 that accounts for almost 80% of the water resources in Egypt. 80% of the cultivated land is located in the Delta and the Nile Valley (old land).

Figure B-5 Development of Cultivated land area in Egypt from 2005 till 2017⁸⁷



⁸⁷ Source: http://www.capmas.gov.eg/Pages/IndicatorsPage.aspx?page_id=6151&ind_id=2361

Currently, the utilization of treated wastewater in Egypt for irrigation purposes is regulated by the law (Code 501/2015 for Wastewater Reuse and Law 84/1982 and subsequent bylaws), with different irrigation uses depending on the degree of wastewater treatment. The approximate amount of treated wastewater used in irrigation is 300 million m³ per year.

However, the challenges in this sector are represented in:

- Inefficient and unsustainable irrigation practices;
- Water scarcity problems;
- Inefficient energy practices in operating the irrigation system (e.g. pumping stations);
- Improper management of agricultural wastes (e.g. burning of agricultural residues);
- Absence of an integrated development approach to the agriculture sector;
- Degradation of soil quality and agricultural products as a result of excessive use of synthetic fertilizers and pesticides;
- High vulnerability of the sector to the impacts of climate change that will be represented in reduction in the yield of some crops and change of agricultural areas. It will also lead to the spread of fungal plant diseases, and will have a negative impact on the Delta's agricultural land, particularly the northern areas bordering the Mediterranean coast⁸⁸

Another problem related to food losses and waste encountered during the post-harvest handling is the improper means of transport, storage and crops processing, affecting the food quality and losses in the market. For example, losses in wheat from harvesting to baking process are estimated to be 13 - 15%, while losses from rice are estimated to be at 25%. Losses of fruits and vegetables also reach high values; with losses in fresh fruits reaching around 19% and that of fresh vegetables reaching around 29%. One of the common identified causes of postharvest losses in Egypt is due to the overloading of trucks⁸⁹.

The government has been introducing new trends to improve post-harvest handling procedures, such as storage of wheat in plastic silos, and conversion of food waste into biomass to increase their value. However, there are still several measures that need to be taken to reduce food losses and waste from the agriculture sector that have been identified by the government, such as⁹⁰:

- Conducting surveys to identify the magnitude and causes of food losses quality and quantity in the food value chain;
- Assess the locally available tools for the harvesting and post-harvesting process (packaging, transportation for each commodity);
- Applying research development to improve the quality of harvested products to meet international standards;
- Promoting the development of on-farm, low-cost drying processes of crops to bring down the moisture content of crops in order to reduce losses;
- Provision of adequate investments to reduce food losses.

On the other hand, following figure demonstrates the fertilizers use intensity in Egypt compared to regional averages. It clearly demonstrates the high consumption rates of fertilizers in Egypt as a result of the degrading soil quality, in addition to the variation in the consumption rates of fertilizers depending on the crop type and soil quality. For example, fruits cultivation in Egypt require high rates of fertilizers

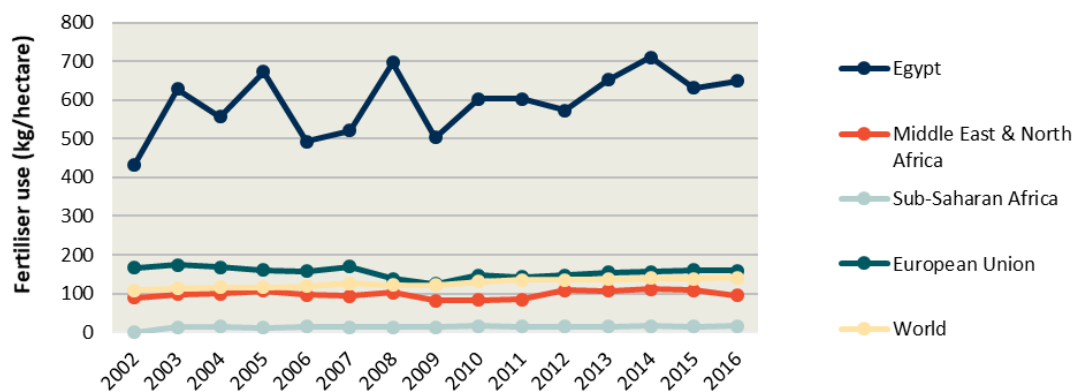
⁸⁸ Source: Egypt's National Strategy for Adaptation to Climate Change and Disaster Risk Reduction

⁸⁹ Source: <https://www.slideshare.net/ifpri/amal-mhassan-2017-ifpri-egypt-seminar-series-food-loss-and-waste-in-egypt/1>

⁹⁰ *ibid*

per hectare, compared to grains like wheat⁹¹. It is also worth noting that the government has been expanding its agricultural practices in reclaimed lands, which require additional fertilizers due to the low quality of soil, as it mainly targets converting desert areas into agricultural lands.

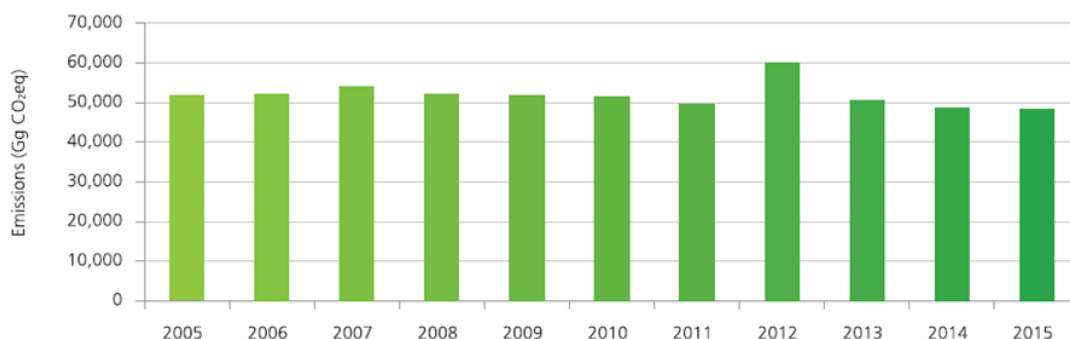
Figure B-6 Fertilizer use intensity in Egypt compared to regional averages



Source: World Bank - World Development Indicators.

The Agriculture, Forestry and Other Land Use (AFOLU) sector in Egypt was responsible for 14.9% of the total GHG emissions in 2015 according to the Egyptian Biennial Update Report (BUR) amounting to 39,446 GgCO₂e (figure B-7); where emissions from rice cultivation, agricultural soils and field burning of agricultural residues represent around 9%, 5% and 1% respectively.

Figure B-7 Trends of GHG emissions from the AFOLU sector in Egypt⁹²



This sector is a priority sector to the Egyptian Government, and it has been strongly addressed in several strategies and action plans, given its contribution in the Egyptian economy and its vital role in achieving food security and its effect on the food industry which is one of the most important industries in Egypt. Also, given that it consumes large amounts of water, minimization of water consumption in the agriculture sector is a top priority for the government, as a result of water scarcity problems in Egypt due to several factors that include climate change.

Moreover, food losses and waste from the agriculture sector have also been addressed in SDS 2030. However, even if strategies and action plans in the agriculture sector are not framed as circular economy measures / actions but rather as sustainable consumption and production measures and practices, they

⁹¹ Source: A study on Chemical fertilizers industry in Egypt, Central Agency for public mobilization and statistics of Egypt, 2014

⁹² Source: Egypt's 1st BUR report

however follow approaches that are interlinking with circular economy concepts. For these reasons, we can explore circularity opportunities in the agriculture sector.

Industry

The industrial sector in Egypt is one of the cornerstones of the Egyptian economy; contributing to around 34% of the GDP and is a major consumer of energy in Egypt⁹³. The current phase of Egypt's industrialization stage can be identified as an emerging industrial economy. The consequence of the expansion in the industrial sector led to an increase in resources and in energy consumption (and thus, GHGs emissions) accordingly. It is worth noting that a segment of the existing industries is old and still use inefficient outdated technologies which are less efficient in materials, water and energy use.

Based on previous studies and surveys carried out by national and international organizations, it was estimated that there is a potential for energy savings in Egypt reaching about 23%. Of this 23%, the industrial sector holds up to 40% of the total energy savings potential⁹⁴ using commercially available advanced technologies in Egypt that improve their energy efficiency in addition to improving their operational performance. Improvements are due to the adoption of energy efficiency and operational performance measures.

Indeed, Egypt is among the most energy intensive economies in the MENA and globally twice as high as Morocco and Tunisia and four times countries like Japan and Germany. On sectoral level, most industrial processes, have 20+ consumption than international practices. Innovation in this arena and resource utilisation would improve costs and competitiveness of Egyptian enterprise.

In this context, the EUD in Egypt is putting a lot of emphasis on supporting **Private Sector Competitiveness through Green Initiatives in Energy and Resource Utilisation** and demonstrating the importance of growth in these businesses in creating employment. Some very recent examples are different grants funded under the umbrella of the EU Facility for Inclusive Growth and Job Creation programme (2016 / 039-543), through the *CfP entitled Innovation for Inclusive Growth and Job Creation in Egypt* (161377).

A good example is the project “*Magnifying Competitiveness and Competences of Green Tech Businesses in Egypt*” which aims to **empower circular economy in Egypt** and accelerate transition to UN2030 SDG via empowering the green technology-based solutions and enterprises (budget 500,000 EUR) . Another good example is the project “*affordable Resources for Egypt's Industrial Growth (RIndustry)*” whose overall objective is to **change the culture of resource utilization in Egypt's industry** for enhanced economics and competition in relation to **Energy production, water extraction and/or recycling, and energy efficiency** employing research & development (R&D) and innovative and sustainable solutions (budget 765000 EUR).

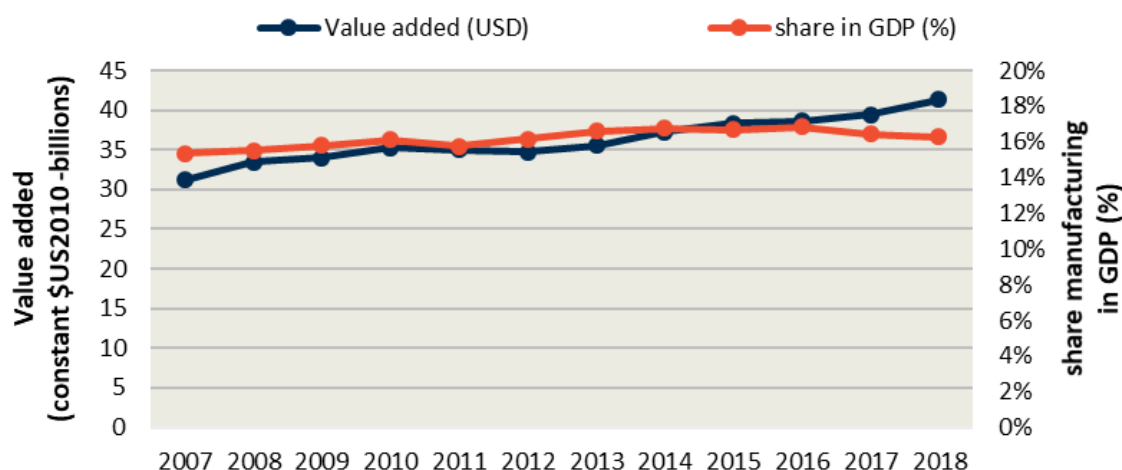
According to Egypt's Industrial Development Strategy in 2012, the industry sector officially employs around 2.4 million workers, with an estimated 1.5 million in informal establishments (about 20% of the labour force) in around 26,000 registered industrial facility. The industrial sector growth in Egypt is

⁹³ Source: Egypt's first BUR Report
(https://www4.unfccc.int/sites/SubmissionsStaging/NationalReports/Documents/7852916_Egypt-BUR1-1-BUR%20Egypt%20EN.pdf)

⁹⁴ Source: Egypt's first BUR report

affected by several factors that include business climate, licensing, incentives to local and foreign investments in the industrial sector⁹⁵.

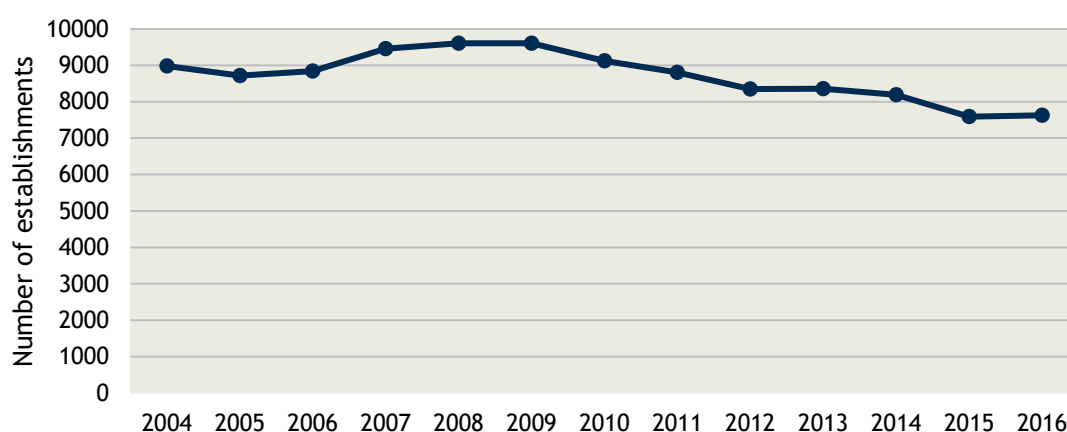
Figure B-8 Development of value added created in manufacturing in Egypt from 2007 - 2018 and the share in overall GDP



Source: World Bank - World Development Indicators.

The industrial sector suffered during the crisis from 2012 till 2015 (see Fig. B-9), as a result of shortages of fuels and electricity supplies. This was attributed to the political disturbances in the country at that time that led to slow down of oil and gas productions and explorations, and the heavy reliance of the industrial sector and energy generation sector on 3 types sources for energy (Natural gas, diesel and heavy fuel oil). During the energy crisis, the government took a decision to divert natural gas from heavy industries to the power plants to generate electricity to make up for the power generation deficit. This had a huge negative impact on the industrial sector, which explains the decline in the number of industrial establishments in the private sector as show in the following figure. It also reduced the country's export from several sectors; most importantly the cement sector.

Figure B-9 Development on the number of industrial establishments in the private sector from 2004 to 2016



In terms of GHG emissions on the national level, the industrial sector is responsible for 12.5% of the total GHG emissions in Egypt. The following table represents the breakdown of GHG emissions from the

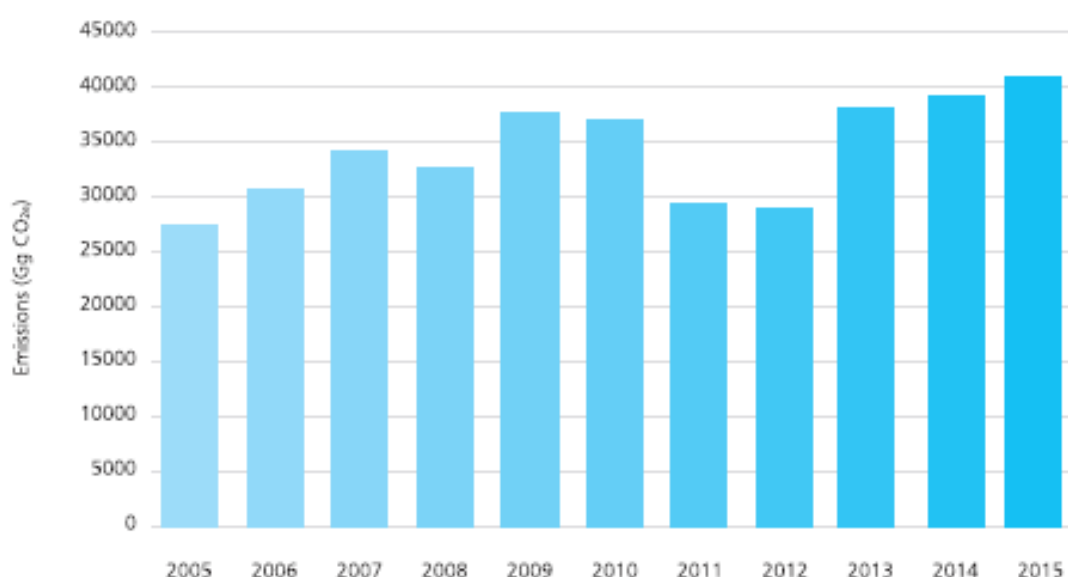
⁹⁵ Source: Industry and Trade development strategy 2016 - 2020, Egyptian Ministry of Trade and Industry

Industrial Sector in Egypt (total Greenhouse Gas Emissions (Gg) in CO₂ equivalents), which clearly demonstrates that the minerals industry is the major contributor to GHG emissions in the industrial sector. The link between GHG emissions and CE activities cannot be made yet as this breakdown is not available yet for Egypt.

Table B-1 Break down of GHG emissions from the Industrial Sector

Subsector	Gg CO ₂ e
Mineral Industry (Cement, Lime, Glass, ...etc)	13,956
Chemical Industry (Fertilizers, petrochemicals,etc)	4,554
Metal Industry (Iron and steel, Aluminum, Zinc...etc)	8,727
Product uses as substitutes for Ozone depleting substances	43
Total	27,780

Figure B-10 Development of GHG emissions from the industrial sector from 2005 to 2015⁹⁶



The above figure shows that total GHGs emissions from the industrial sector have increased from 27.2 million tCO₂e in year 2005 to 40.67 million tCO₂e in year 2015, with an annual growth rate of 4.1% and an overall increase of 49%. This is attributed to the following factors:

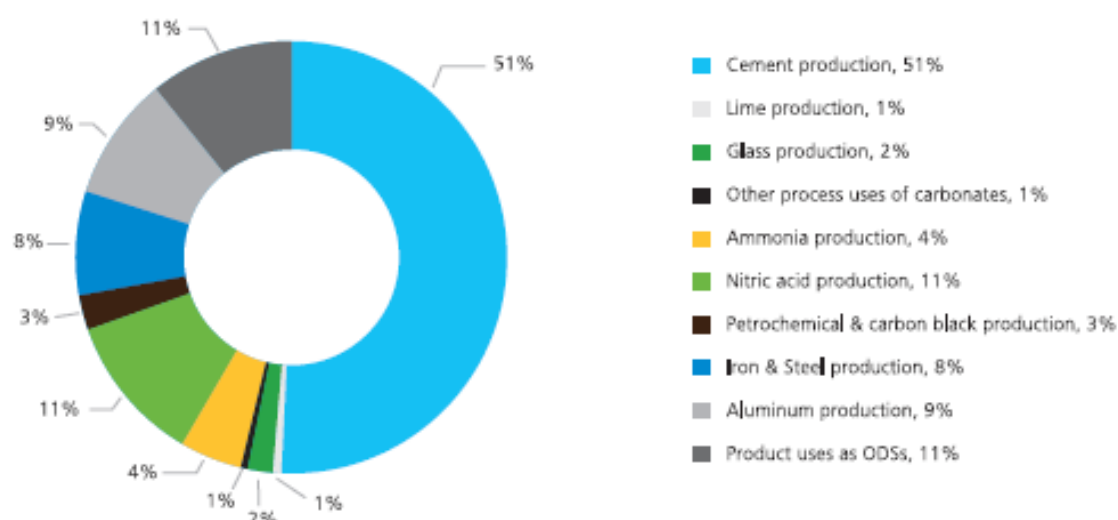
1. The growth of the mineral industry in Egypt at a steady rate, especially the cement industry;
2. The chemicals industry has also been growing, specifically the fertilizers industry and the petrochemical industries (e.g. Methanol, ethylene and polyethylene, Urea, styrene, polystyrene, polypropylene, PVC, LLDPE, HDPE, PET)⁹⁷ - plastics are discussed in a separate section below;
3. The growth of the iron steel industry operated by the private sector, while on the other hand, iron and steel plants owned by the public sector were facing some challenges, while the steel industries operated by the private sector were thriving;
4. Phase out of the ozone depleting substances from the early 2000s, accompanied by high growth rate of emissions from substitutes for ozone depleting substances between 2005 and 2015.

⁹⁶ Source: Egypt's first BUR report

⁹⁷ Source: Presentation by the Egyptian Petrochemicals Holding Company (<http://echem-eg.com/wp-content/uploads/2019/04/Petrochemicals-industry-current-threats-and-future-plans-.pdf>)

The key category analysis of the emissions from the Industrial Processes and Product Use (IPPU) sector in Egypt revealed that the cement sector is the major contributor to GHG emissions in the industrial sector.

Figure B-11 Contribution of each subcategory to the total Industrial GHG emissions⁹⁸



The development of the industrial sector is guided by the Sustainable development strategy SDS 2030 in addition to the Industry and Trade Development Strategy 2016-2020. Both initiatives have a set of targets and key performance indicators for the manufacturing sector. There are also several initiatives and programmes that are taking place to develop the industrial's sectors towards circular economy. The Egyptian Sustainable development strategy SDS 2030 has also addressed resource efficiency in the industrial sector in several pillars. Moreover, the Industry and Trade Development Strategy addresses resource efficiency throughout several projects, which aim at improving production efficiency and reducing waste of resources especially in food, textiles and engineering industries.

Textiles

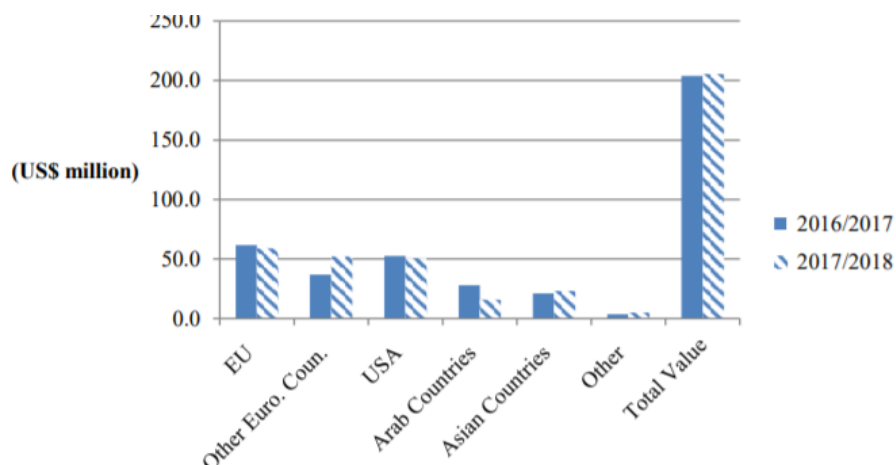
Textiles industry is one of the most important industries in Egypt, as it plays a central role in the Egyptian economy. It contributes to 3% of the Egyptian GDP, 30% of industrial work force (representing around 8% from the country's workers) and represents around 10% of the country's exports⁹⁹.

According to the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS), Egyptian textile and Ready-made garments/textile (RMG/T) firms are mainly private, consisting of 28 public textile facilities, 10,452 private textile facilities, and 48,444 private RMG/T facilities. The below figure shows that most of Egyptian textile and Ready-Made clothes exports are directed to the EU.

⁹⁸ Source: Egypt's first BUR report

⁹⁹ Source: Integration of Energy Efficiency into the Textile Sector Strategy, Industrial Energy Efficiency Project, UNIDO, August 2018

Figure B-12 Textile fabrics Exports During 2016/2017 and 2017/2018



This sector has been negatively influenced by regulatory changes in the agricultural sector in 1993 which led to the neglect of Egyptian cotton production. In 1994, Egypt has issued Law number 210, which reorganized the cotton trade in Egypt. This Law caused a rise in cotton prices, as a result of the cotton trade liberalization, which led to the closure of some spinning and weaving companies. This rise in prices seems to have benefited traders more than farmers who were even more discouraged to continue production. This Law was amended with decree number 4 for year 2015, to repair some of the losses caused by Law 210 /1994 by adding some cotton types to be traded by the ministry of agriculture. The international competition due to lower costs overseas made the Egyptian producers unable to compete with other markets (e.g. China) and caused a strong decline in the sales of domestic textile and RMG.

However, the government is planning to flourish one of its important industries again. The industry and Trade Development Strategy 2016-2020 is planning to establish new industrial city clusters allocated for the textile sector solely; with the aim of developing the textile industry and attracting foreign investments. One of the projects identified by the strategy (project number 1.5: Enhancing the Industrial Competitiveness Project) aims at achieving technological and industrial progression in several sectors including the textile sector through a set of outputs, one of which involves the “development of a specialized program for the enhancement of production methods and knowledge transfer that increases production efficiency, reduces the waste of resources and increases the added value in several sectors that include textile industries”¹⁰⁰.

The government is also setting a vision for the cotton sector that integrates agricultural, commercial and industrial dimensions of the industry, that focuses on maximizing the utilization of the available resources.

The textiles sector is also being targeted under the SWITCH-MED project as a result of its strategic importance and the direction of government towards its revival. Hence, this sector will play an important role in circular economy in Egypt. The project supported companies in the textiles sector (as well as other sector: chemicals and food production) in taking the necessary steps to introduce effective monitoring systems of resources consumption (water, materials and energy). The program aimed at enhancing productivity of the participating companies from the textiles sector (and other sectors) by integrating practices and technology in a matter that maximizes efficiency of resources consumption and

¹⁰⁰ Source: Industry and Trade development strategy 2016 - 2020, Egyptian Ministry of Trade and Industry

production, through the utilization of natural resources, reducing waste generation, reducing energy consumption and supporting opportunities for innovation¹⁰¹. It focuses on addressing the challenges and barriers facing the participating companies that hinder them from becoming more resource and energy efficient, non-polluting and safe, and supports companies to produce products that responsibly managed throughout their production life cycle, while increasing their productivity and maintaining access to international markets with good quality products.¹⁰²

One example on the results obtained from the implementation of the EU-funded SWITCHMED project and its sustainable production component implemented by UNIDO “MED-TEST II” in Egypt in the textiles sector can be shown in the following box¹⁰³.

Box B-1 El Askary Dott Jeans

El Askary Dott Jeans, one of the participating companies in MED-TEST II project in Egypt from the textile sectors identified total annual savings in reaching around 80,402 euros (5% raw materials savings per year and 29.9% energy savings per year) through an investment of 122,000 euros (giving a payback period of 1.5 years). This investment involves improving the computerized marker development and transferring the cutting process from manual to automatic to decrease losses in the cutting process and enhance productivity. Moreover, the company suggested selling fabric waste to other consumers who can recycle fabric wastes. This project resulted in materials savings reaching 17.4 tons per year.

MED-TEST III project is planned to be launched in Egypt, with a main focus on applying circular economy in the textiles sector value chain.

Plastics

Between 2004 and 2016, the number of plastic and rubber factories in Egypt increased from 1,276 to more than 2,412 registered factories¹⁰⁴ - with an estimated 1,500 to 2,800 informal factories - resulting in estimated direct employment of 415,000 employees¹⁰⁵.

Egypt produces around 1.1 million tons of plastics raw materials per year, while local plastic companies consume around 2.2 million tons of plastics raw materials per year. Accordingly, Egypt imports a wide range of polymers that are used as raw materials and additives for plastic industry (e.g. LDPE, PET, ABS). The national petrochemicals companies produced around 47% of the local plastic requirements of raw material in 2016; where 28% of the requirements of local plastic industries from raw material are covered by the local petrochemical companies, and the remaining portion is exported. There are eight petrochemical plants in Egypt that produce plastic raw materials as shown in the following table.

¹⁰¹ Source: UNIDO activities in Egypt 2017 - 2018

¹⁰² Switch-MED, MED TEST II Egypt: Transfer of Environmentally Sound Technology in the Southern Mediterranean Region

¹⁰³ Source: Al-Askary Dott Jeans company fact sheet, MED TEST II Case Study (https://www.test-toolkit.eu/wp-content/uploads/2019/10/El-Askary_EN.pdf)

¹⁰⁴ http://www.epema.org/industry_profile.aspx

¹⁰⁵ Plastics Value Chain Mapping and Assessment, Strengthening Entrepreneurship and Enterprise Development (SEED), AECOM, USAID Cairo/Egypt, 2017

Table B-2 Petrochemical companies in Egypt producing raw materials for plastics industry¹⁰⁶

Petrochemical company	Products (plastics raw material)	Capacity (Kton/y)	Exports (Kton/year)
Sidi Kerir Petrochemicals (SIDPEC)	HDPE, LLDPE	225	100
Egyptian Ethylene and Derivatives Company (ETHYDCO)	HDPE, LLDPE	400	200
Egyptian Petrochemicals Company (EPC)	PVC and its compounds	80	10
Egyptian Styrenics Co for polystyrene (ESTyrenics)	Polystyrene	200	-
Egyptian Propylene and Polypropylene Company (EPPC)	Polypropylene	350	200
Oriental Petrochemical for Polypropylene (PP) (now Holding Carbon Co.)	Polypropylene	160	-
Egyptian Indian Polyester Company (EIPET)	PET	420	-
Indian Petrochemical Industry TCI Sanmar group	PVC and its compounds	200	60

The growth in the number of factories could be attributed to the investments in the plastics industry in that reached 7.8 billion USD in 2016¹⁰⁷. Polyethylene, polyvinyl chloride suspension, PET, and thermoset plastics are the most common locally manufactured products, while propylene continues to be imported. Most of the plastics raw materials are imported from Asia (40%), the EU (10%) and other markets (5%). On the other hand, Egypt imports from machinery and equipment used in the plastic industry comes from China (37%) followed by the EU (35%)¹⁰⁸.

The Far East and Russia have penetrated the market with acceptable quality plastic products. However, the main suppliers of plastic and rubber products are China and the gulf countries¹⁰⁹.

When it comes to plastic recycling industry, around 290,000 to 300,000 tons/year of local plastic wastes are sorted for plastic recycling process, and most of the recycled plastic material is distributed among local plastic recycling facilities, with minor exports of recycled plastic compounds¹¹⁰ (e.g. BARIQ company in Egypt producing recycled PET). The amount of recycled plastic waste represents around 11% from the total produced plastic wastes in Egypt.

¹⁰⁶ ibid

¹⁰⁷ <https://egyptplast.com/market-background/>

¹⁰⁸

https://2016.export.gov/build/groups/public/@eg_main/@byind/@manufind/documents/webcontent/eg_main_081772.pdf

¹⁰⁹ https://wits.worldbank.org/CountryProfile/en/Country/EGY/Year/LTST/TradeFlow/Import/Partner/by-country/Product/39-40_PlastiRub

¹¹⁰ Plastics Value Chain Mapping and Assessment, Strengthening Entrepreneurship and Enterprise Development (SEED), AECOM, USAID Cairo/Egypt

This sector faces several constraints and bottlenecks that challenge its sustainable production¹¹¹:

- Access to materials:
 - Insufficient production capacity of local petrochemical companies to cover the requirements of the Egyptian plastics market (around 28% of the raw material requirements of the plastic industry were met by local petrochemical companies), since a portion of petrochemicals is being exported;
 - High costs of raw materials and the unclear and inconsistent application of customs tariffs to the imports of raw materials that are used in the plastics industry;
 - Difficulty in obtaining recyclable raw materials to be used in the plastics recycling manufacturing due to lack of raw materials due to the improper waste management practices in Egypt that involve scavenging and picking of valuable plastic wastes by the informal sector. This is in addition to the low quality of raw materials available in markets for plastics recycling due to lack of awareness of specifications and standards in addition to unknown sources of recycled materials.
- Access to markets and marketing services:
 - The difficulty of accessing reliable sources of information such as: statistics of local markets, export opportunities, new products or alternatives to imported ones, opportunities to use idle capacities for outsourcing, statistics of imports private-sector producers.
- Administrative obstacles and work environment represented in bureaucracy and complexities in the process of approval of industrial licenses in municipalities. However, this problem has been tackled by changes in the industrial licensing law that expedites the licensing process to encourage further investment in the industrial sector;
- Access to equipment, skilled labour and quality testing centres, and obtaining finance to invest in and further upgrade the sector.

Similar to the textiles sub-sector, the development of the plastics sub-sector to improve its sustainable production and circularity has been addressed in the Industry and Trade Development Strategy 2016-2020. However, the major challenge that could face this sector (in relation to circular economy) is the informal waste separation and collection of dry valuable recyclables that include plastic that could have otherwise been used in plastics recycling industry. Furthermore, technical knowledge related to applying circular economy measures in the plastics sector need to be transferred to Egypt, where opportunities relevant to the national conditions and circumstances could be identified and further explored.

Food Processing and Manufacturing

Food processing and manufacturing industry is considered a key industry in Egypt; with over 7000 manufacturing companies in Egypt contributing 4.7% of the GDP in 2016¹¹² ¹¹³. This sector is the second largest manufacturing sector in Egypt after petroleum refinery industry; accounting for 15% from the total manufacturing industry¹¹⁴. This sector has been continuously growing since 2012, where this growth is mainly attributed to the increase in production for national consumption and exports. Egypt also

¹¹¹ibid

¹¹² <https://www.dailynewssegypt.com/2018/01/15/egypts-food-industry-achieved-22-5bn-revenues-2017-usda/>

¹¹³ Source: USDA Foreign Agricultural services, Egypt food processing Ingredients report, 2018 (https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Food%20Processing%20Ingredients_Cairo_Egypt_2-22-2018.pdf)

¹¹⁴ Source: <https://stat.unido.org/country-profile/economics/EGY>

imports food ingredients from the United States and the European Union, with imports reaching 4 billion USD in 2017.

This sector is a priority sector for the government in the Industry and Trade Development Strategy 2016 - 2020, and it shows potential for resource efficiency (water, materials and energy) according to the SWITCH MED project. Participating companies from the food sector identified 141 measures for resource efficiency measures, where 100 of them have been accepted. These measures have a payback of short to medium term, where such measures resulted in water, materials and energy savings¹¹⁵. The following box provides an example on one of the outputs of the participating companies in the SWITCHMEDI project from the food and beverages sector¹¹⁶.

Box B-2 Arab French Company for Dairy and Cheese Products

Arab French Company for Dairy and Cheese Products, one of the participating companies in the SWITCHMED project in Egypt, identified total annual savings in reaching around 93,341 euros (0.5% raw materials savings per year, 29% water savings per year and 24% energy savings per year) through an investment of 52,890 euros (giving a payback period of 0.6 years). This investment involves energy optimization (through waste energy recovery), using trigger nozzles instead of hoses for floor washing, installation of water meters for improvement consumption monitoring and installing water efficient devices. Moreover, the company suggested recycling and valorisation of solid waste by sorting solid waste to be recycled instead of being disposed, in addition to reprocessing of off-spec products to produce cattle feed instead of being incinerated. This project resulted in materials savings reaching 19 tons per year and water savings of 8630 m³ per year.

This sector shows a good potential for cooperation in circular economy. Agri-food waste has a huge potential to be used as raw material for the production of several products that are currently being imported in Egypt such as pectin which can be manufactured from oranges peels and Egypt is among the top 5 countries worldwide in the exports of oranges. Also, lycopene can be produced from tomatoes wastes which is used as a raw material in pharmaceutical industries. In addition, rice husks can be used in the production of white fumed silica which is used as thickener in the chemicals industry which is currently being imported. However, agri-food industries need technological support and capacity building in identifying and implementing opportunities that support the CE measures.

Tourism

Tourism sector in Egypt is one of the main contributors to the national economy, where its real contribution to the GDP reached 11.9% in 2018 (around 22 Billion Euros) and it employed around 1.143 Million employers in year 2018¹¹⁷.

The number of hotels and resorts in Egypt was reported to be 1,090 in 2017 in addition to 34 floating hotels; with 300 chain hotels and resorts across major cities. The current capacity of rooms in Egypt reached 205,000, with governments' plan to add more 8000 rooms in 2020, with over 20 hotels re-opening again in 2020¹¹⁸. Statistics show that most tourists visiting Egypt are European Tourists; accounting for 61.2% from the total percentage of tourists visiting Egypt in 2018¹¹⁹.

¹¹⁵ Source: Switch-MED, MED TEST II Egypt: Transfer of Environmentally Sound Technology in the Southern Mediterranean Region

¹¹⁶ Source: https://www.test-toolkit.eu/wp-content/uploads/2019/10/AFDPL_EN.pdf

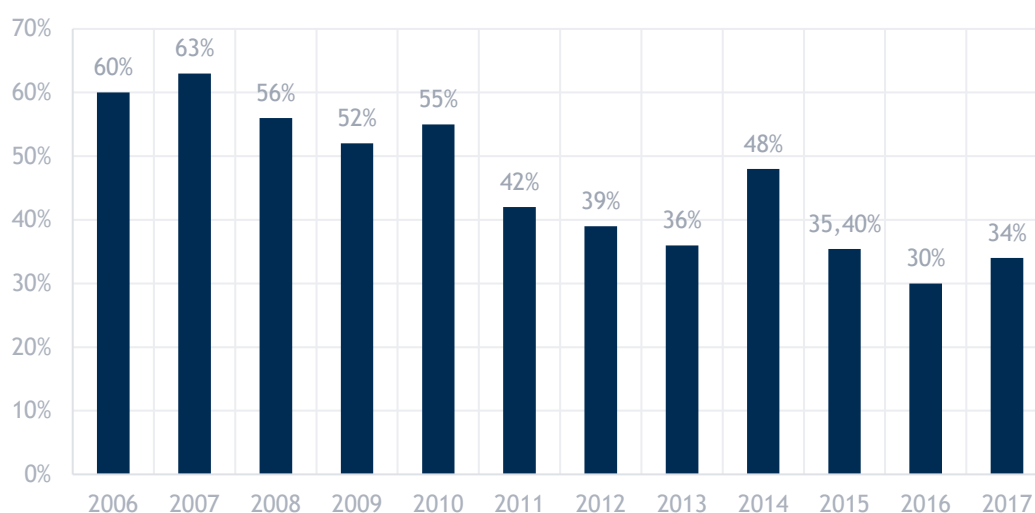
¹¹⁷ Source: <https://www.statista.com/statistics/1010324/egypt-real-contribution-travel-tourism-gdp-egypt/>

¹¹⁸ Source: Interview with Chairperson of the Egyptian Hotel Association (EHA) Maged Fawzy (<https://www.dailynewssegypt.com/2019/11/24/eha-to-add-8000-hotel-rooms-across-egypt-early-2020-with-800m-investments/>).

¹¹⁹ Source: Statistical Yearbook - Tourism, CAPMAS

The tourism sector in Egypt faced a strong fall in the occupancy rate after the revolution in 2011, and it started to gradually recover by 2014, where shortly afterwards in 2015 it suffered a major hit due to the Russian plane crash over Sinai, which killed all on board in late 2015. The following figure demonstrates the drastic change in the hotels occupancy rates in Egypt from 2006 till 2017; reaching 34% occupancy rate in 2017 compared to 63% in 2007.

Figure B-13 Trends of Hotels Occupancy rates (%) in Egypt from 2006 - 2017¹²⁰



However, during the past 2 years, the tourism sector started to recover even more strongly; with revenues increasing by 28.2 percent in FY 2018/2019 reaching \$12.5 billion, compared from \$9.8 billion in FY 2017/2018 and the sector's growth reached 16.5%, according to WTTC data, ahead of the global average of 3.9 %¹²¹. The central bank of Egypt has also provided loans to finance hotels' renovation¹²².

Figure B-14 Revenues from the Tourism sector (in USD billions)¹²³



¹²⁰ Source: <https://www.ceicdata.com/en/egypt/hotel-room-occupancy-rate/hotel-room-occupancy-rate-average>

¹²¹ Source: <https://www.wttc.org/about/media-centre/press-releases/press-releases/2019/wttc-announces-minister-ania-al-mashat-of-egypt-as-2019-global-champion-for-tourism/>

¹²² Source: Interview with Chairperson of the Egyptian Hotel Association (EHA) Maged Fawzy (<https://www.dailynewssegypt.com/2019/11/24/eha-to-add-8000-hotel-rooms-across-egypt-early-2020-with-800m-investments/>).

¹²³ Source: <https://tradingeconomics.com/egypt/tourism-revenues>

Forms of tourism in Egypt vary between cultural tourism, recreational tourism, environmental tourism, therapeutic tourism, and religious tourism.

In terms of waste generation and emissions, it is estimated that the amount of domestic waste generated from hotels and resorts in Egypt is 1.5 kg/person/day, which is 50% higher than the average waste generation rate per capita per day in urban areas¹²⁴.

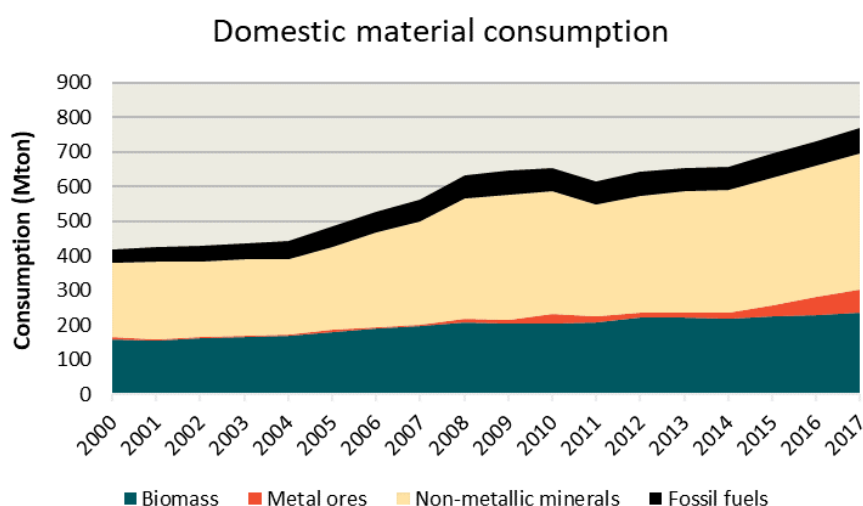
Emissions from the tourism sector are not estimated as a standalone sector, however, they are mostly attributed to energy consumption, and are accounted for in the emissions from the energy sector.

Trends in consumption patterns

Trends in material consumption

Along with the growth of the population and the economy, Egypt's domestic material consumption has grown as well. In the period 2000-2017, domestic material consumption¹²⁵ increased by 83% from almost 420 to almost 770 million ton, making it the largest material consumer in the African continent (**Error! Reference source not found.**). However, resource consumption per capita grew only by 31% during the same period. Resource consumption per capita in Egypt is quite similar to the north African average, but higher than the African average. Still, it's only about half of the average per capita resource consumption in Europe.

Figure B-15 Overview of domestic material consumption by type in Egypt for the period 2000-2017.

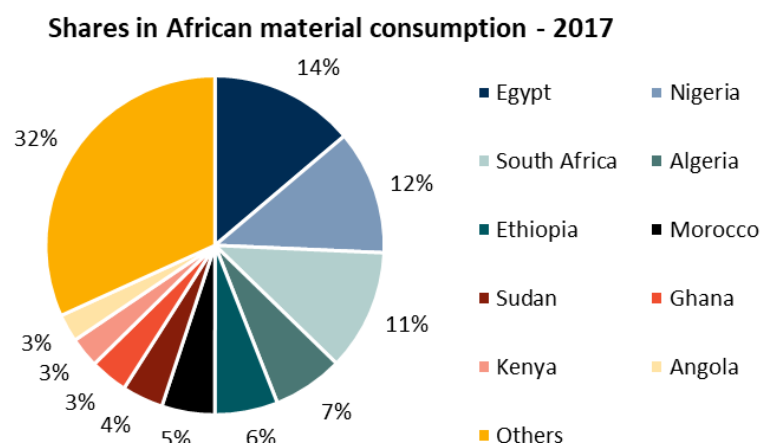


Source: SDG Indicators - Indicator 12.2.1 Domestic Material Consumption by type.

The increase in non-metallic mineral consumption is related to the growing demand for cement (as explained in the section below).

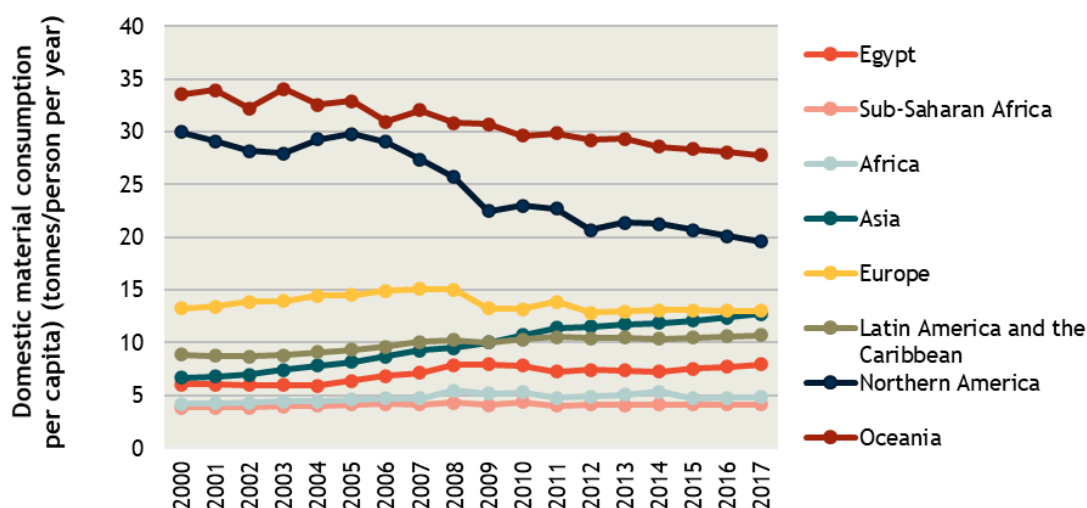
¹²⁴ Source: <http://www.eeaa.gov.eg/seam/Manuals/DakahSolidWaste/Chapter2.pdf>
¹²⁵ Domestic Material Consumption = domestic material extraction + material Imports - material exports

Figure B-16 Top 10 of African countries in terms of Egypt and other African countries in total domestic material consumption, with Egypt ranking 1st domestic



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

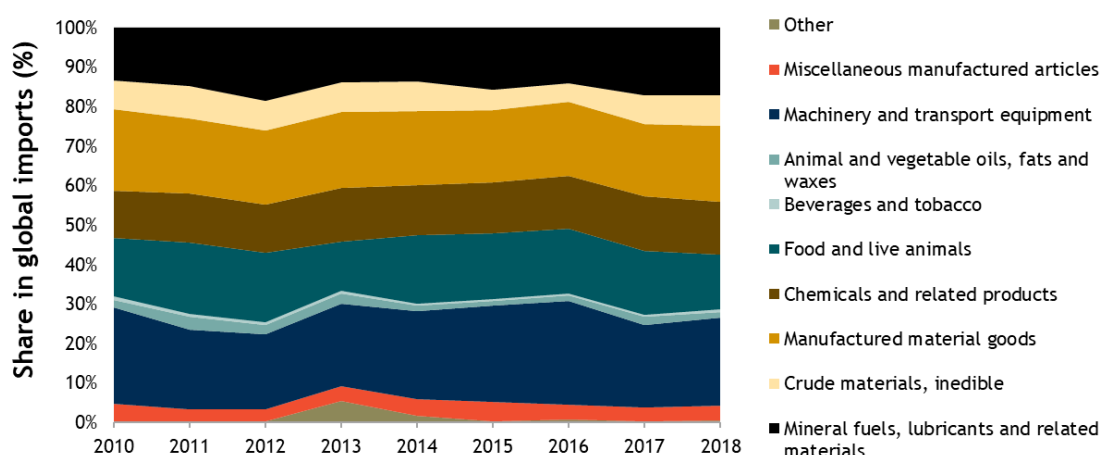
Figure B-17 Material consumption per capita in Egypt compared to regional averages



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

The growing domestic demand for materials in Egypt has been satisfied by a simultaneous growth of domestic production and imports, although most of the growth in demand for non-metallic minerals (predominantly cement) has been met through an increase in domestic production. As shown in figure below, the share of materials and natural resources in Egypt's import balance has remained relatively constant (around 55%), despite growing demand. This indicates that the changes in the imports of final products have been more or less in balance with changes in imports of material resources.

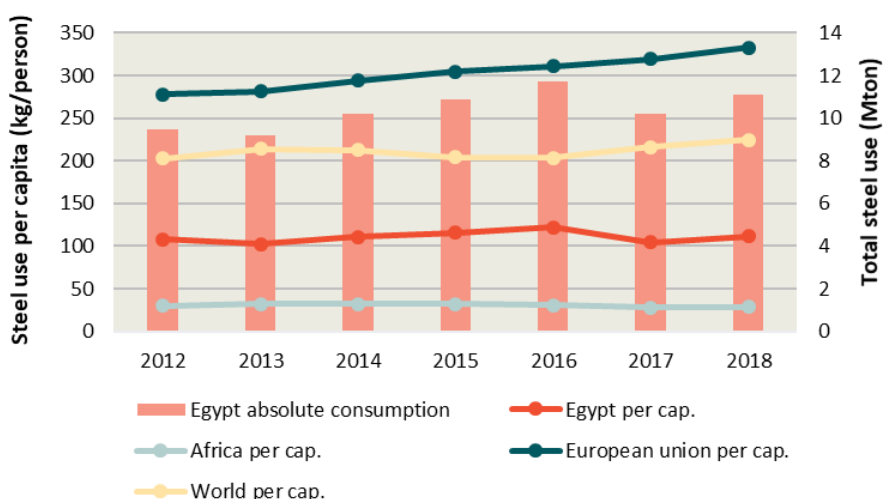
Figure B-18 Shares of different product types in Egypt's import balance



Source: UN Comtrade

Globally, cement, steel and plastics account for almost 70% of the direct global GHG emissions from industry and therefore, it is relevant to look at the trends in the consumption footprint for these materials. Egypt is a large cement consumer, with an annual consumption of 54 Mtons. As such, Egypt was the 9th largest consumer of cement in the world in 2017.¹²⁶ Cement consumption has grown strongly over the last two decades, explaining a large part of the increase in demand for non-metallic minerals. When we look at steel, we see that consumption is growing slowly in absolute terms, even though the per capita consumption remains relatively stable (Error! Reference source not found.). In 2016, 2.23 million tons of plastics were consumed in Egypt, which is equivalent to 23.6 kg/capita,¹²⁷ compared to 95.5kg/capita in the European Union (+Norway and Switzerland) and a global average of 44.9kg/capita.¹²⁸

Figure B-19 Consumption of finished steel products per capita in Egypt compared to regional averages.



¹²⁶ Source: International Cement Review (2018) - A review of global cement industry trends.¹²⁶

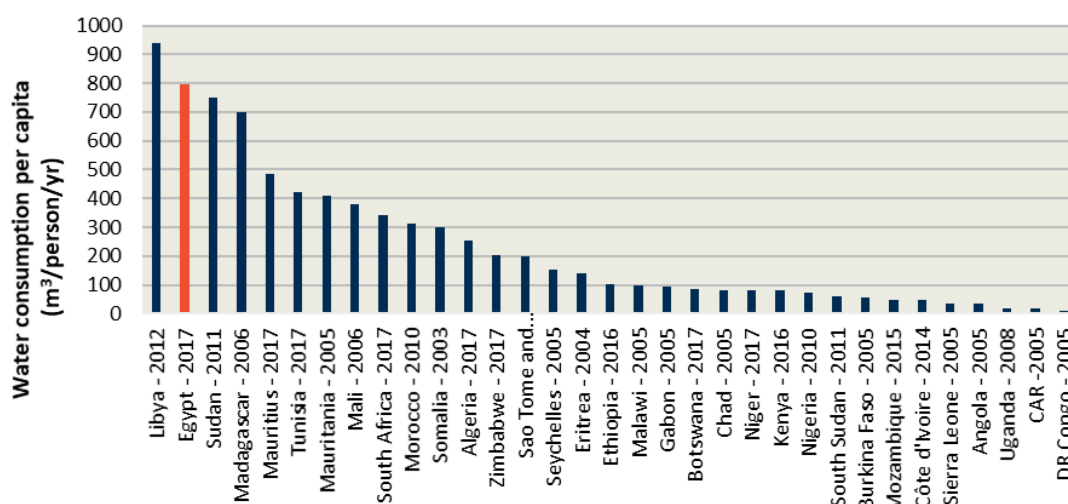
¹²⁷ SEED, AECOM, USAID Cairo/Egypt (2017) Plastics Value Chain Mapping and Assessment, Strengthening Entrepreneurship and Enterprise Development. Combined with population statistics from: UN - World Population Prospects 2019.

¹²⁸ Plastics consumption data from: PlasticsEurope (2017) Plastics - the Facts 2017. Combined with population statistics from: UN - World Population Prospects 2019.

Source: World Steel Association (2019) World steel in figures 2019.¹²⁹

Water is a scarce resource in Africa and even more so in the northern countries of the continent. Still, there are 4 North African countries in the African top 10 of water consumption per capita and Egypt is number 2.¹³⁰ This high-water consumption occurs at the backdrop of very low water availability. Egypt's water withdrawal exceeds the available annual freshwater availability with almost 20%. Egypt can still do so due to its 63 desalination plants and it is in the process of expanding its desalination capacity. 19 new plants are under construction, and another 21 plants are planned. By the end of 2022, Egypt's daily desalination capacity should amount to 2.5M m³.¹³¹ A company from the United Arab Emirates has offered Egypt to construct part of the new desalination capacity (with a capacity of 500.000 m³/day) for \$800 M.

Figure B-20 Water withdrawal per capita in Egypt compared to other countries. Year indicates the time of measurement.



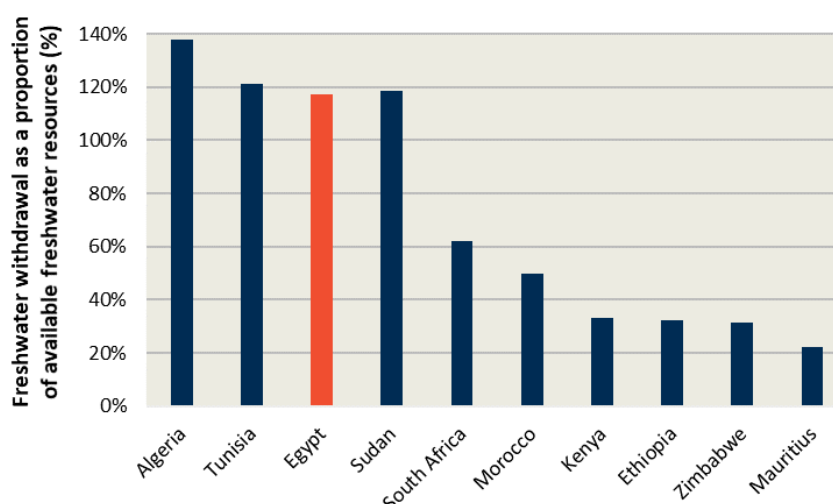
Source: FAO Aquastat - Total water withdrawal per capita (m³/inhab/year).

Figure B-21 Freshwater withdrawal as a proportion of the available freshwater resources for Egypt and other African countries (with recent data).

¹²⁹ <https://www.worldsteel.org/en/dam/jcr:96d7a585-e6b2-4d63-b943-4cd9ab621a91/World%2520Steel%2520in%2520Figures%25202019.pdf>

¹³⁰ NB this top 10 is not based on all African countries but only on countries with data no older than 2005.

¹³¹ <https://www.dailynewssegypt.com/2019/11/10/uae-company-offers-to-establish-800m-desalination-plants-in-egypt/>



Source : FAO Aquastat - SDG Indicator 6.4.2.

The end-of-life stage: reverse logistics, reuse, waste generation and management

Table B-3 Annual Generation rates of solid wastes and their current waste management practices¹³²

Type of Solid Waste	Annual Generation rate (in Million tonnes)	Current Waste Management Practices
Agricultural wastes	31	<ul style="list-style-type: none"> Significant amounts of agricultural wastes are either burned in the agricultural fields or dumped on the banks of drains, resulting in deterioration of the water quality and risks of blockages to water flow. The EEAA has made extensive progress in containing this issue, where currently large amount of rice straws is being recycled and used as an alternative fuel in some industries (e.g. Cement industry) which led to improvement
Municipal solid waste (MSW) (domestic waste)	21	<ul style="list-style-type: none"> Public sector (Municipalities of each governorate) provides waste management services, and the role of private sector is limited to the collection. However, the quality of their services is not satisfactory. Informal sector (Traditional waste collectors) called “Zabbaleen” play an important role in the municipal waste collection services. They have been originally/informally in charge of the waste management services until the public sector took over it. This community is a strong one; with almost 96,000 persons working in it. Since their livelihood depends on it, they achieved very high recovery rates of wastes (reaching 80%). The formalization of the waste sector in Egypt led to big conflicts with the Zabbaleen sector. They still offer door-to-door waste collection services in Cairo, Giza and other governorates. They have their own sorting and recycling facilities, but their main problem is their lack of concern of health and safety issues. Another informal activity takes place; where people known as waste pickers carry out separation of wastes and collection of dry valuable recyclables (plastics, cardboard, metals...etc). They perform the separation in on the waste

¹³² Status of Environment reports (year 2016), Egyptian Environmental Affairs Agency, Ministry of Environment and SWEEP-Net report, Egypt, 2014

Type of Solid Waste	Annual Generation rate (in Million tonnes)	Current Waste Management Practices
		<p>dumped in streets, collection bins, collection points, transfer stations and dumpsites that are uncontrolled.</p> <ul style="list-style-type: none"> 81% of the wastes are dumped in open dumpsites and unmanaged landfills, 12% recycled and 7% landfilled in sanitary landfills¹
Construction and demolition waste	5.8	<ul style="list-style-type: none"> Formally dumped in construction and demolition landfills. However, illegal dumping takes place on the public roads and in undeveloped lands may occur, causing traffic disruptions and negative impacts on the air quality It is worth mentioning that there is a big uncertainty in real amount of construction and demolition waste generated,
Industrial Waste	4.9	<ul style="list-style-type: none"> Non-hazardous wastes are Usually collected by contractors, and treated in the same way as municipal solid wastes 65% are estimated to be properly disposed There is a broad variation in the amount of generated industrial hazardous waste, which indicates the lack of information on the actual amount of industrial hazardous waste generated which in turn indicates the improper management of these types of wastes.
Hazardous Waste	0.54	<p>Hazardous wastes generated from industrial zones are usually collected by authorized contractors and dumped in the only hazardous waste managed landfill in Egypt: Nasiriya Hazardous Waste Treatment Centre (NHWTC). It is the only hazardous wastes landfill in Egypt and is conceived for the treatment of hazardous wastes.</p>
Medical Waste	0.52	<ul style="list-style-type: none"> 85% of the generated medical wastes are non-hazardous, and is no different than the household wastes The collection, treatment and disposal of hazardous medical waste are the responsibility of the Governorates, either directly or by contracting private companies, contractors, or NGOs (188 incinerators across the Governorates, and 48 units of shredding autoclaves) According to the SWEEP NET report, the treated portion of hazardous medical wastes in Greater Cairo region is around 27%, and the remaining percentage is either mixed unlawfully with municipal solid wastes or illegally traded for recycling. This indicates the poor management of hazardous medical wastes system.
Sludge from wastewater treatment plants	2	<ul style="list-style-type: none"> Managed by the Egyptian National Holding Company of Water and Wastewater (HCWW) Majorly used in agricultural applications, and some projects are currently using sludge for the generation of biogas (Gabal El Asfar wastewater treatment plant). It is also co-fired in cement plants as an alternative fuel. The introduction of a new waste-to-energy tariff in the Egyptian electricity law will have a positive impact on directing the use of sludge generated from WWTP

Type of Solid Waste	Annual Generation rate (in Million tonnes)	Current Waste Management Practices
		in energy generation ((either through mechanical dewatering and selling of dry sludge cakes or through generation of biogas (sludge digesters).
Waterways cleansing wastes	25	Under the management of Ministry of Water Resources and Irrigation
Total	90.76	-

In addition to the waste types mentioned in the table above, Egypt is also a large producer of electronic waste. In 2016, 0.5 Mtons of E-waste were generated in Egypt, which makes the country the largest domestic E-waste producer on the African continent (accounting for 23% of Africa's E-waste generation).¹³³ A small portion (15-20%) of the e-waste is recycled, and the rest are managed by the informal sector and civil society organizations or ends up in open dump sites, mixed with municipal solid waste.

According to the Biennial Update Report of Egypt, the waste sector was responsible for 8.1% from the total GHG emissions in 2015.

Figure B-22 Trends of GHG Emissions from the Waste Sector in Egypt



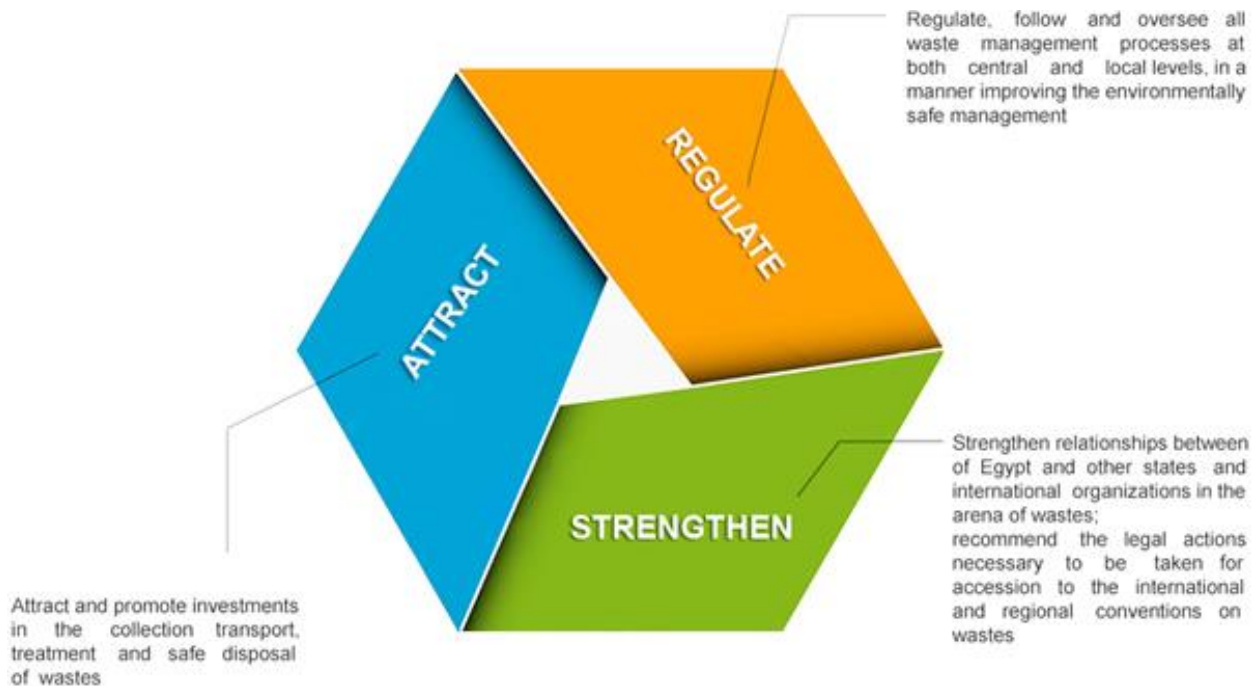
Source: Egypt's first Biennial Update Report, 2018

In response to the waste management problems in Egypt, the waste management regulatory authority (WMRA) has been established in 2015, in an effort to reduce the negative impacts of the ever-growing waste challenges faced by Egypt. It is planned for the WMRA to become the singular coordination agency responsible for regulating, following up and overseeing all waste management processes at both central and local levels. It also intends to strengthen relationships between Egypt and other states and international organizations in the arena of waste, and attract and promote investments in the collection transport, treatment and safe disposal of wastes¹³⁴.

¹³³ UNEP (2018). Africa Waste Management Outlook. United Nations Environment Programme, Nairobi, Kenya

¹³⁴ Egypt's first Biennial Update Report, 2018

Figure B-23 Mission of the new Waste Management Regulatory Authority ¹³⁵



Source: Website of Egypt's waste management regulatory authority (www.wmra.gov.eg)

Additionally, the National Solid Waste Management Programme (NSWMP) that was launched in 2012 supports the Waste Management Regulatory Authority (WMRA) in establishing a sustainable and integrated solid waste management system in four governorates (Kafr El Sheikh- Gharbeya- Assiut- Quena). This programme is co-financed by national (30%) and international (70%) funding institutions:

- Egyptian Government represented by the Ministry of Environment;
- EU (European Union);
- German Ministry for Economic Cooperation and Development (BMZ) through the German Bank for Reconstruction (KfW) and GIZ;
- SECO (State Secretariat for Economic Affairs).

It aims at restructuring and developing the Egyptian waste management sector, employing modern management tools and enhancing business in an environmentally friendly manner within an integrated waste management framework.

There is a very big potential of circular economy activities in the waste sector, and there are several programs and initiatives in Egypt taking place in the waste sector, that are not necessarily framed under Circularity, but have the same approach and lead to similar results. The public sector in Egypt is currently prioritizing the waste sector reform. The prime minister of Egypt is also giving a close attention to waste and recycling programs. It is worth exploring opportunities with the waste management regulatory authority.

On the other hand, private sector programmes/initiatives in Egypt could show great potential, with current ongoing initiatives that achieve circular economy targets. The GIZ in Egypt identified 19 business opportunities that are deemed feasible in the waste sector in Egypt. The following figure

¹³⁵ www.wmra.gov.eg

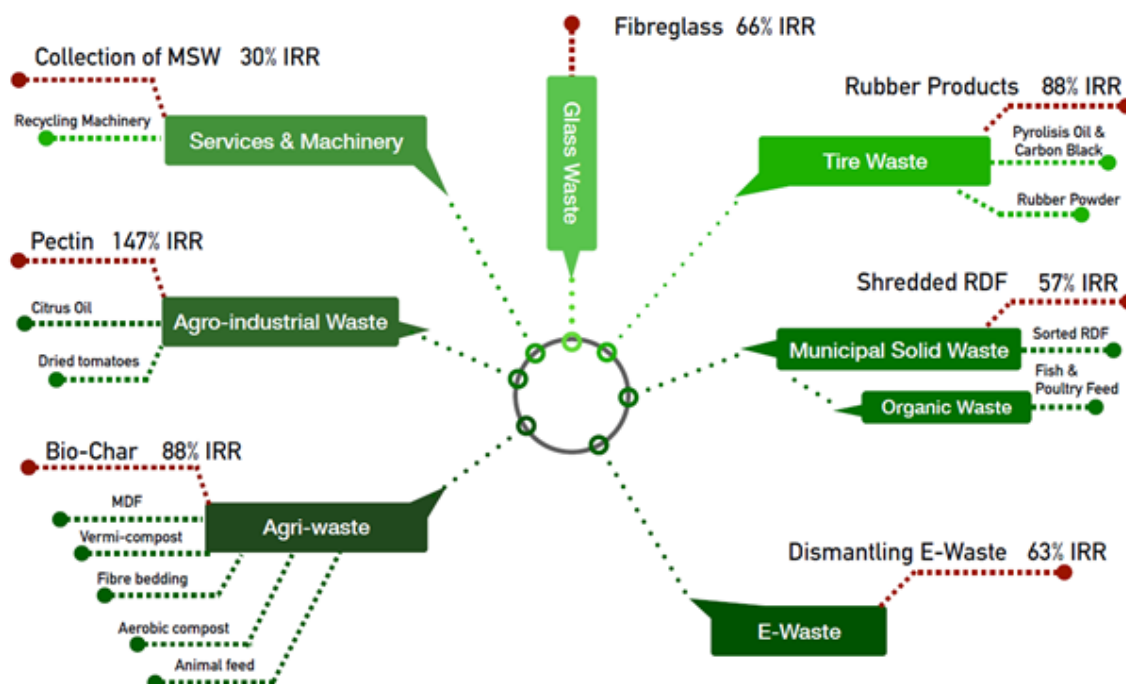
summarizes these opportunities and the anticipated IRR from them. These opportunities will result into diversion of waste from landfills (~ 13 Mtons/year) and will also result in the creation of new job opportunities.

Despite the fact that circularity in the waste sector has great potential, it is, however, hindered by several obstacles as identified by entrepreneurs in Egypt in the recycling industry that include, but are not limited to, the following¹³⁶:

- Lack of data availability on waste generation and collection rates and market data;
- Access to finance;
- Existing regulatory frameworks in Egypt and administrative procedures in the public sector in addition to the scattered responsibilities within this sector;
- Lack of entrepreneurship knowledge on how to start and grow a business.

¹³⁶ Towards a Circular Economy: 19 Business Opportunities for startups in Egypt's Waste Sector, presentation by Karina Boers, GIZ Advisor for Private Sector Engagement at the National Solid Waste Management Programme, 2019 (http://www.cairoclimatetalks.net/sites/default/files/Towards%20a%20Circular%20Economy_Ms.%20Karina%20Boers.pdf)

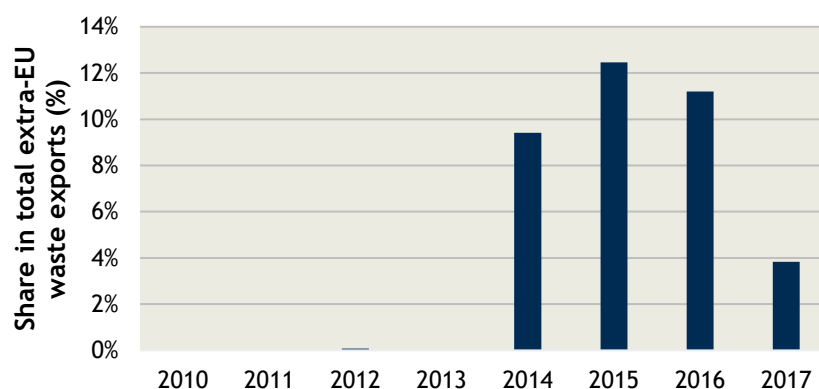
Figure B-24 Potential business opportunities in the waste sector in Egypt¹³⁷ (IRR: Internal rate on return)



Waste imports to Egypt

Although the EU treats a large share of its waste domestically, there is also a proportion of the waste that is exported to other countries. Transboundary shipments of waste have to be registered as defined in the Waste Shipment Directive and all registered waste shipments are recorded in Eurostat. In the last few years, a significant share of the EU's exported non-hazardous waste is shipped to Egypt. In 2014, shipments took off and in 2017 they declined again. In Europe, the UK is responsible for almost all of these waste shipments, which at their peak were equivalent to around 0.1% of the UK's total generation of non-hazardous waste. Most of the wastes are metal, plastic and rubber wastes used for recycling purposes in Egypt.

Figure B-25 Non-hazardous waste exports from the EU to Egypt as share in total extra-EU non-hazardous waste exports



Source: Eurostat - Waste shipment statistics [env. wasship]

¹³⁷

http://www.cairoclimatetalks.net/sites/default/files/Towards%20a%20Circular%20Economy_Ms.%20Karina%20Boers.pdf

Policy framework supporting circular economy activities

Overview of the policy framework in the context of circular economy

As previously mentioned in section 2.2, the Egyptian constitution - amended in 2014 - addresses sustainable development in several articles; emphasizing the value of sustainable development as a main pillar to achieve prosperity. It also refers to sustainable development as a right and obligation for current and future generations.

- *Article (27) states that the economic system aims at achieving prosperity through sustainable development and social justice in order to raise the real growth rate of the national economy, raising the standard of living, increasing job opportunities, reducing unemployment rates and eliminating poverty.* This article acknowledges related tools and instruments to achieve sustainable development, including green economy and sustainable consumption and production.
- *Article (32) mentions that the state commits to making the best use of renewable energy resources, motivating investment, and encouraging relevant scientific research.* This article directly refers to the importance of diverting towards the investment in renewable energy.
- *Article (46) states that every person has the right to a sound healthy environment, as environmental protection is a national duty, and the state shall take necessary measures to protect and ensure not to harm the environment; ensure a rational use of natural resources so as to achieve sustainable development and guarantee the right of future generations thereto.* This article highlights the importance of citizens' behaviour in using and consuming resources, thus encouraging responsible consumption.
- *Article (79) includes that every citizen has the right to healthy and sufficient food and clean water, and that the State shall also ensure sustainable food resources to all citizens, and ensure sovereignty and maintain agricultural biological diversity and types of local plants in order to safeguard the rights of future generations.*

The SDS defined certain goals that are directly connected to circular economy¹³⁸. They will be elaborately detailed for each sector as follows:

1. Solid waste management in Egypt's SDS 2030

Egypt's SDS addresses the solid waste topic in the environmental pillar (9th pillar). It identified several objectives, including:

- Reducing the amounts of wastes generated from the electricity sector;
- Establishing and implementing monitoring procedures to monitor the progress of waste reduction in the energy sector;
- Reusing and recycling industrial wastes;
- Maximizing the use of agricultural wastes by recycling and producing compost;
- Reusing and recycling municipal solid wastes and improve the efficiency of the solid waste management system;
- Integration of waste management concepts in the education system.

2. Agricultural sector in Egypt's SDS 2030

Egypt's SDS 2030 sets priorities for the agricultural sector mostly under the economic dimension. The main policies that are linked to circularity in Egypt's SDS are as follows:

- Developing the agriculture technology;

¹³⁸ It is worth mentioning that Egypt's SDS 2030 is currently being upgraded, with more specific indicators and updated programs and visions, but the update is not published yet.

- Rationalize the consumption of water in agriculture and developing an integrated water resources management system;
- Prevent losses in water irrigation systems by rehabilitating the national infrastructure for water systems;
- Rehabilitate old pumping stations to improve their production and energy efficiency;
- Using desalinated sea water and brackish water for irrigation.

3. Industrial development in Egypt's SDS 2030

The SDS addresses the industrial sector development to achieve circular economy across several pillars as demonstrated in the below table.

Table B-4 Industrial development across different pillars of the SDS 2030

Pillar	Linkage to CE
Economic Pillar	Applying green economy concepts to the industrial sector to increase its competitiveness among the international markets and preserve the environment, rationalize the use of resources (energy, water and resources), promote the use of alternative energy, reduce the unit cost of production and optimize resources consumption.
Energy Pillar	Development of a policy for the rationalization of energy consumption in the industry sector
Environment Pillar	<ul style="list-style-type: none"> – Adopting fiscal policy reforms to encourage sustainable consumption patterns of water and natural resources – Raising the awareness to reserve environment and natural resources, providing incentives for more advanced alternatives and technologies for water conservation and natural resources protection – Adopting policies to reduce air pollution adjust to climate change and protect the environment, where industry sector shall play an important role in. – Development of incentive policies to support energy conservation efforts in industry sector – Development of incentive policies for the consumption of renewable energy in the industry sector

In addition to the SDS, the other main strategy that addresses sustainable consumption and production is Egypt's National Action Plan for Sustainable Consumption and production (SCP) that was developed under the SWITCH-MED program. This action plan builds upon national strategies and policies that integrates the efforts of the Egyptian government to promote green policies in 4 priority sectors (energy, municipal solid waste, agriculture and water).

It intends to support the creation of sustainable communities and cities in Egypt through the promotion of sustainable consumption and production patterns. The SCP action plan is guided by Egypt's green economy strategy and Egypt's SDS 2030. The SCP action plan identified the key elements for each of the priority sectors (excl. energy) as follows:

1. Solid waste management:

The SCP action plan identified the following key actions to achieve an integrated waste management system, with a long-term target to develop a National Integrated Resource Management System to operate a circular economy:

- Promote good governance
- Promote R&D and innovation in the waste sector

- Support public awareness, community engagement and facilitating access to information through education
- Restructure of certain public institutions and changing legislations, providing access to finance, and encouraging investments, expand the recycling sector, endorse the concept of polluter pays principle, and adopt the process that promotes the reduction, reuse, recycling, and recovery of waste.
- Integration of the informal sector waste collectors in the formal collection system.
- Raising awareness of the public on the importance of combating marine litter in Egypt

It identified the following activities in the solid waste sector, which are directly linked to circular economy:

- Reducing plastic bags consumption (by NSWMP). This program has already been implemented in some governorates (e.g Red Sea governorate); where single -use plastic bags have been banned.
- Extended Producer Responsibility Pilot- E-Hub project (by NSWMP) for electronic goods.
- Industrial (non-hazardous) Waste Management and SME Entrepreneurship Hub in Egypt (by ENCPC). This project promotes the use of industrial waste in support of a zero- waste policy and supports a flourishing recycling market.

2. Agriculture

Agriculture sector is one of the key priority sectors that are addressed in the SCP. The key strategic orientation in the agriculture sector aims to achieve the following:

- Introduce solar powered water pumps to replace traditional water pumps, and the use of solar energy to power water desalination stations for agricultural cultivating purposes
- The utilization of agricultural waste to produce energy and biofuel
- The use of new modern grain storage mills to cut on wastes and promote more sustainable storage practices to avoid food losses.

The SCP identified the following key projects under the agriculture component:

- Facilitating Access to finance for Green Growth & SCP practices by providing support to the private sector through the provision of financial packages that promote different SCP applications to be implemented that support the creation of a green more sustainable agriculture practices that include water savings, waste savings and energy savings.
- Policy Tools towards Transition to Green Economy: National Green Economy Reviews (NGER) in Egypt. This project aims at building on several national studies at assessed Egypt's potential to transfer to a green economy, but with detailed sectoral focus on the agriculture sector. This is to continuously monitor progress achieved in the agriculture sector this goal in light of Egypt's Sustainable Development Strategy, by taking into account international sustainability experience in the agriculture sector.
- Mainstreaming Green & Sustainable Public Procurement in the public sector to encourage sustainable consumption and production on the national level.
- Eco-innovation in Small and Medium-sized Enterprises in the agriculture sector
- Renewable Energy Applications for Improving on-farm Irrigation systems
- Promoting Sustainable Agricultural Production by optimizing water and fertilizers consumption in reclaimed desert Lands
- Utilizing Solar Energy for drying agriculture products in Egyptian Rural Areas
- Promoting Agricultural Waste Recycling in Egypt's Governorates

3. Water

Water sector has been identified as a priority in the SCP as a result of increasing water demand due to population growth, agricultural and industrial expansion, unsustainable water consumption and insufficient supply of water covering the water demand. The SCP has identified the following projects that are directly interlinked to circularity:

- Implementing an integrated wastewater reuse pilot project by using secondary treated wastewater to reclaim lands for cultivation
- Implementing a sustainable water production and consumption model for the allocation and use of conventional and non-conventional water resources in sustainable desert communities
- Siwa (city in Egypt) sustainable consumption and production water strategy
- Development of water strategy to raise water consumption efficiency in Fayoum governorate in Egypt
- Supporting the ministry of water resources and irrigation in Egypt to develop its research capacity and identify and adopt informed decisions for sustainable water resources management.

Furthermore, one of the important national strategies that includes aspects supporting circular economy and has been used to develop the national SCP is the sustainable competitiveness strategy for Egypt (2012) that includes a specific chapter for the sustainable and green growth for Egypt (chapter 5). The strategy identifies enabling conditions for sustainable and green growth in Egypt that include:

- Integrating environmental and social considerations into economic policy
- Identifying market-based incentives and tax policies for different sectors (agriculture, transportation, construction and housing, industry)
- Subsidy reforms as a part of the incentives and regulatory measures
- Encouraging technology and innovation
- Adjusting trade policies to support green growth objectives, e.g. by removing/reducing tariffs on environmentally sound technology
- Greening of public procurement
- Raising awareness
- Identifying sustainable development indicators
- Allocating finances and involvement of private sector

Environmental standards and regulations/law

The main law that addresses environmental matters in Egypt is the Environmental Law 4 for the year 1994 amended by Law 9 /2009 and law 105/2015, and its executive regulations amended by ministerial decrees No. 1095/2011, 710/ 2012, 964/2015, 618/2017 and finally 1963/2017. The main entity governing the environmental law is the Egyptian Environmental Affairs Agency (EEAA). However, the environmental law with its current form has no special stipulations for climate change mitigation or circular economy concepts. Nevertheless, the ministry of environment is currently conducting legislative reforms in the environmental law that shall address circular economy aspects which demonstrates the government's interest in the adoption of circular economy measures.

The current environmental law states that all establishments must obtain their environmental approval before issuing the remaining licenses (e.g. land allocation, utilities connections. Etc) to establish and operate their facility.

Waste management in Egypt is majorly regulated under the Environmental Law 4/1994 in addition to public cleanliness law no. 28/1967. The responsible regulatory authority is the Egyptian Environmental Affairs Agency, Waste management regulatory authority (WMRA) in addition to the municipal authorities that are affiliated to each governorate. The environmental law states that no person may collect, transport, sort, recover, store, dispose of manage waste in a manner that results in adverse environmental effects. It prohibits the import of hazardous waste or their transit through Egyptian territory. Annex 11 of the executive regulations no. 1095/2011 explains the specification and regulations of the means of collecting and transporting the wastes and the methods of recycling. It also explains the final disposal procedures and methods.

It is important to note that a unified law to regulate the management of waste of all kinds has been approved by the parliament in August 2020. It is however unclear yet when it will be adopted. The new law aims to organize, follow-up, control and develop all operations related to waste management at the central and national levels, in order to achieve environmental safe management of all types of waste and attract and encourage investments in the waste management sector field of activities for collection, transport, treatment and safe disposal of waste. The law also regulates the roles and responsibilities of organizations involved in the integrated waste management system to ensure the clear definition of roles and overcome the administrative overlapping of roles and responsibilities. The new law aims to ensure the sustainability of the necessary financial resources for the integrated waste management and sets incentives for the investment in the waste management sector. Most importantly, the new waste law addresses circular economy in a whole separate chapter.

In accordance with the environmental law, the executive regulations of the law set threshold limits for air pollutants emittance from industrial establishments. It also identifies the safe exposure limits for different aspects (such as noise, temperature, humidity) in workplaces. The law also calls for the protection of biodiversity, ozone layer, water resources and conservation of natural resources.

On the other hand, agriculture sector is managed by a series of laws and regulations, however, the most relevant regulation to the circular economy is code no. 501 for year 2015 that regulates the use of treated wastewater for irrigation purposes, based on different types of plant species and under specific conditions and degrees of wastewater treatment.

And as for the tourism sector, there are no specific environmental standards to follow other than in the environmental law. However, hotels and resorts that are Green Star Certified must follow the social and environmental standards of the program, where national and international experts audit their performance against these standards. However, hotels and resorts are encouraged to utilize renewable energy sources for water heating through solar water heating, and for electricity generation.

In relation to climate change regulations, Egypt ratified in 1994 the United Nations Framework Convention on Climate Change (UNFCCC) as a member of the non-Annex I Parties. In 1996, the Climate Change Unit was established at EEAA and was upgraded to a Central Department (CCCD) in 2009, in order to strengthen the climate change institutional structure on the national level. The climate change committee was later reformed as the National Climate Change Council (NCCC) in 2015 through the Prime Minister Decree No.1912, with additional mandates and tasks that come to match the rapid transformations on climate change at the national, regional and international levels. Lately, Egypt signed the Paris Agreement in April 2015, which was ratified by the Egyptian Parliament in June 2017.

Egypt submitted its INDC ahead of Paris Agreement in 2015. The INDC includes the following elements:

1. National circumstances that address general economic conditions (economic and population growth rates, main sustainable development goals, and political circumstances of the country)
2. National efforts in adaptation and mitigation, in terms of treating impacts in different sectors (agriculture, water resources, coastal zones, etc.) or efforts made to reduce GHGs emissions in different sectors (energy, transportation, industry, etc.).
3. Adaptation and Mitigation action packages (qualitative targets)
4. Necessary support to achieve the objectives of the plan (funding, capacity building, and technology transfer).

Egypt has however not set any GHG emission reduction target so far.

Trade and investments in the circular economy in Egypt

In general, in terms of goods and services, EU's main imports of goods from Egypt are fuel and mining products, chemicals, textiles and clothing, while the main imports of services consist of travel services and transport. On the other hand, EU's main exports of goods to Egypt are machinery and transport equipment, chemicals, fuels and mining products, and agricultural products, while the main exports of services are business services.

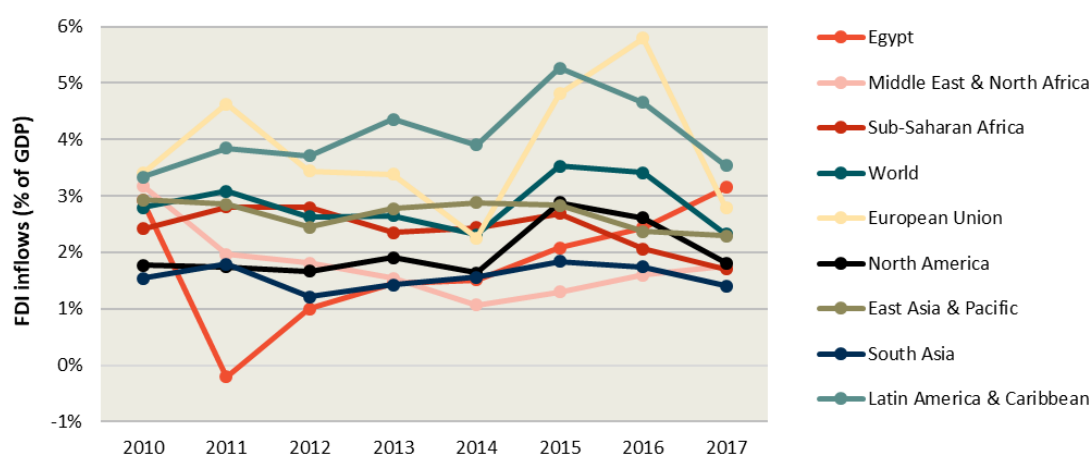
This section looks at the level of trade and foreign investments occurring in Egypt and the factors that influence trade and investment. First, an overview will be given on the trends in trade and investment. Subsequently, several economic, financial and political factors that affect the level of trade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

Overview of ongoing trends in trade and foreign direct investment

Foreign direct investment

When looking at foreign direct investment in Egypt, we see that since a strong dip in investments during the Arab Spring in 2011, foreign direct investment has steadily grown to just above 3% of GDP in 2017. This was the first time since 2010, that the level of foreign direct investment was close again to the world average. Since 2014, foreign direct investment in Egypt as share of GDP is higher than on average in the MENA region.

Figure B-26 imports - FDI inflows as share of GDP (%)

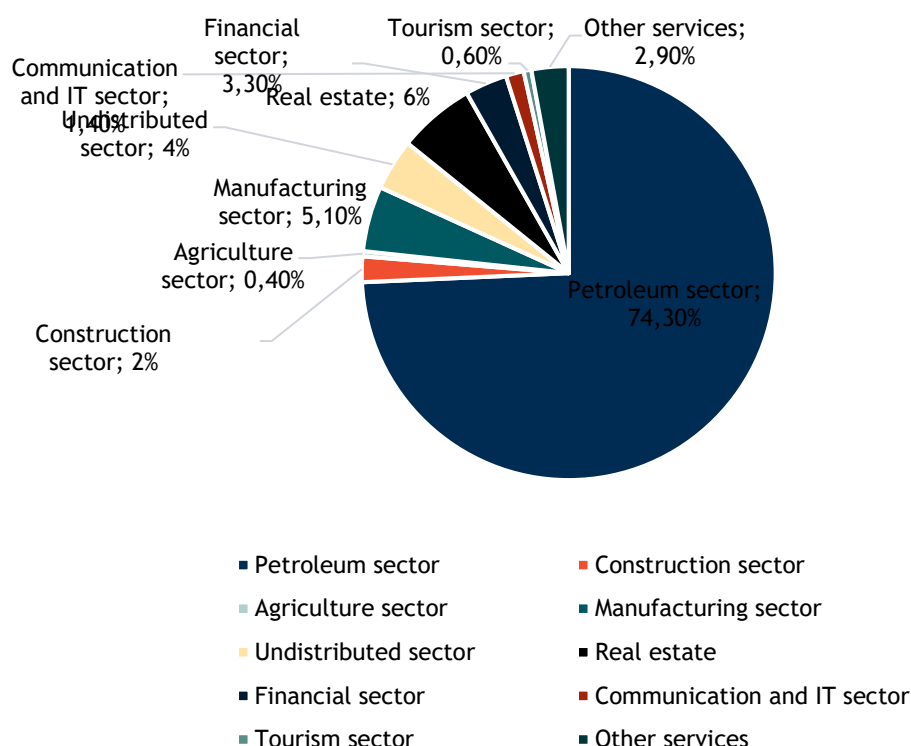


Source: World Bank - World Development Indicators - FDI inflows as share of GDP (%)

In conclusion, there is substantial trade ongoing between Egypt and its international trading partners, although the share of trade in the total economic output is still significantly below the world average. In terms of foreign investments, Egypt seems to fare relatively well in the last few years, with investments steadily growing and now being back on par with the world average.

The following figure also demonstrates of breakdown of FDI by economic sector. It clearly reveals that petroleum sector contributes to the biggest share; however, it also demonstrates that tourism, agriculture and manufacturing sector are among the sectors that are targeted by FDI and were identified as sectors with high CE potential.

Figure B-27 Breakdown of FDI by economic sector in 2018/2019¹³⁹



The government of Egypt has also identified targeted sectors for investment¹⁴⁰. These targeted sectors include, but not limited to, the following: agriculture and land reclamation, textiles, tourism, mining, transportation and logistics, real estate, petrochemicals, petrochemicals, food processing, oil and gas.

These sectors are also cross-cutting with the imports of the EU from Egypt that mostly include fuel and mining products, textiles and clothing and chemicals. Moreover, these sectors also provide good opportunities for CE.

Opportunities and barriers for trade

Trade tariffs

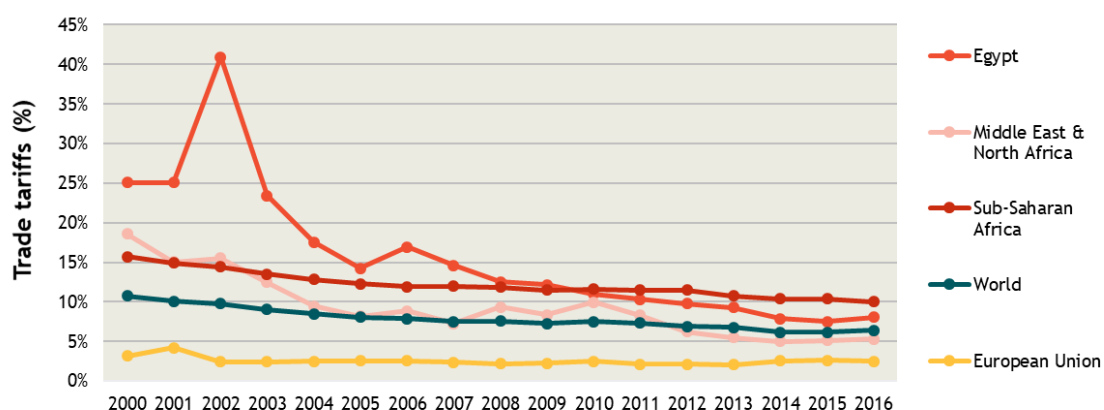
When we look at trade tariffs in Egypt, we can see a long-term downward trend. In the early 2000s, trade tariffs in Egypt were over twice as high as the world average and this declined quickly after the peak in 2002, followed by a slower but continued decline after 2007 to just 25% above the world average in 2016 (see **Error! Reference source not found.**). This all resulted from substantial trade policy reforms. It

¹³⁹ Central Bank of Egypt, External Position Report

¹⁴⁰ (<https://gafi.gov.eg/English/Sectors/TargetedSectors/Pages/default.aspx>).

should be noted though, that the trade tariffs in Egypt are still more than 50% higher than the average tariffs in MENA countries. Although the overall trade tariffs in Egypt declined sharply during the last two decades, the tariffs on primary products are still relatively high. In 2015, the average tariff on primary goods in Egypt was around 23%, whereas for example in the EU this was only 5%. This means that to a certain extent, the relatively high trade tariffs in Egypt will remain a barrier for growth in international trade. When asked for the biggest obstacle in doing business in Egypt, 4.6% of the firms mentioned customs and trade regulations as biggest obstacle in 2016.¹⁴¹

Figure B-28 Mean of the tariff rates applied to all products in Egypt (%)



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

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 scores the trade costs of countries based on empirical research. In this area, Egypt seems to perform very well. Already for a long time, Egypt outperforms the average score of the MENA region as well as the average of Sub-Saharan Africa and the world average. In the period from 2010-2015 Egypt's score steadily increased from around 80 in 2010 to around 93 in 2015. With this score Egypt also outperforms the majority of EU countries on this front. Therefore, the relatively low customs and administration related costs can be seen as a driver for trade in Egypt.

¹⁴¹ World Bank - Enterprise survey (2016).

Figure B-29 Score on cross-border trade costs for exports and imports in Egypt in comparison to global and regional averages.

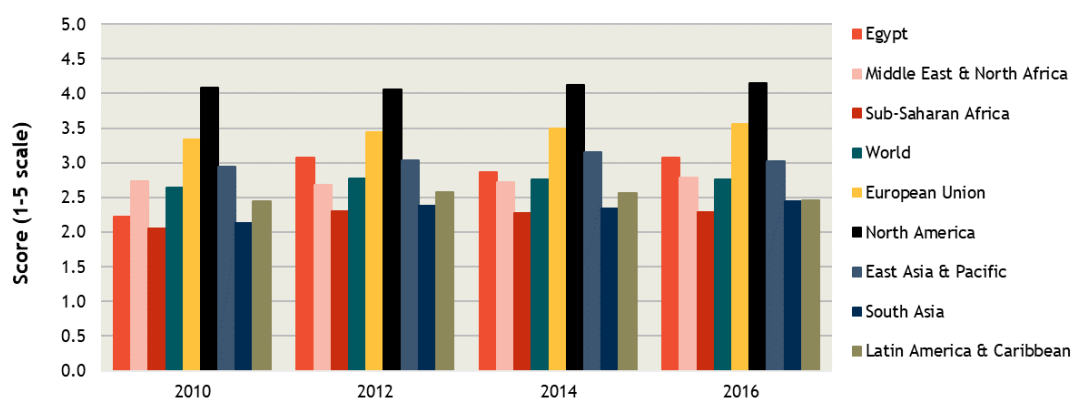


Source: World Bank - Ease of doing business - Trading across borders: Cost to export/import (US\$ per container) (DB06-15 methodology) - Score.

Suitability of infrastructure for trade

In order to facilitate trade, 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. When looking at this index, one can see that the quality of logistics in Egypt has improved significantly during the last decade. In 2010, with a score of 2.2 Egypt performed just above the average of Sub-Saharan Africa and well below the average of the MENA region (2.7) and the world average. However, since then its score has been growing and in 2016 Egypt's transport infrastructure scored a 3.1, which is above all the regional and continental averages of the global south and also above the global average of 2.8.

Figure B-30 Score of Egypt in the Quality of trade and transport-related infrastructure compared with global and regional averages



Source: World Bank - Logistics Performance Index - Quality of trade and transport-related infrastructure.

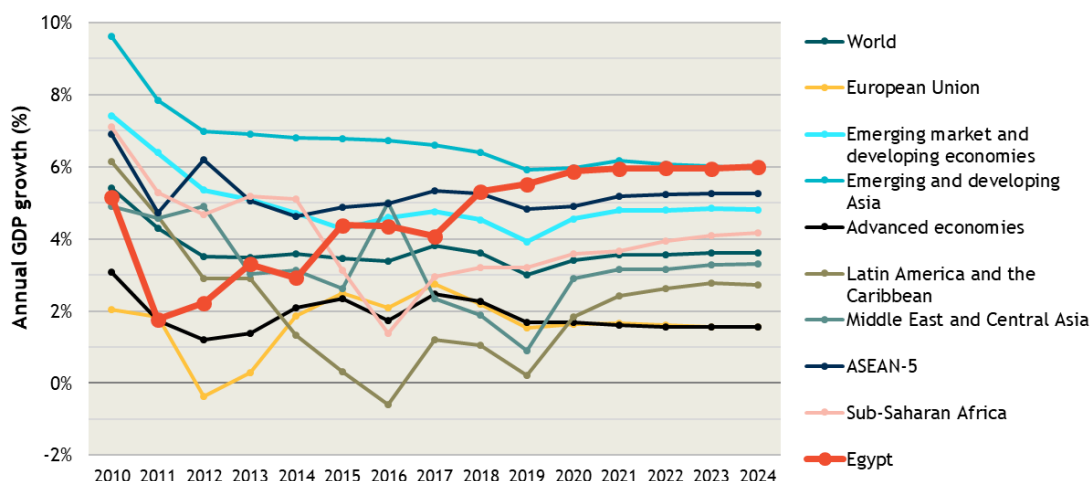
Opportunities and barriers for investments

Economic opportunity

The economic situation in Egypt looks not too bad, which should act as a driver for investments in the country. Over the past ten years, economic growth has been solid, with a small dip during the Arab spring

in 2011. However, since then the annual growth rate kept increasing steadily to 5.5% in 2019.¹⁴² According to the IMF, in the pre-COVID context, growth rates of around 6% were expected during the first years of the 2020s, which is well above the expected average growth rates of the MENA region (3%) and the world as a whole (4%).

Figure B-31 Historical GDP growth and growth outlook until 2024 for Egypt, compared to global and regional averages.



Source: International Monetary Fund - World Economic Outlook.

Ease of starting a business

Starting up business activities in another country can be cumbersome, because as an organisation you need to get acquainted with all the rules and procedures in the country. The World Bank monitors the ease of starting a business in its Doing business survey and Egypt scores relatively well on this indicator with a stable score of 79 (0-100 scale) during the last decade. In this same period, the average score for European Member States on this indicator increased from 84 in 2010 to almost 90 in 2018.

Governance, political stability and regulatory quality

Political instability & security

Since the Egyptian revolution in 2011 when President Mubarak resigned, the political climate in Egypt has been relatively unstable. Political instability is perceived by many entrepreneurs as a major barrier for doing business in Egypt. In the 2013 edition of the World Bank's enterprise survey, 48% of the respondents identified political instability as the most important obstacle for doing business in Egypt, making it the most important obstacle identified in that survey. However, in 2016 this had declined to one third of the respondents, although political instability was still the highest-ranking obstacle in the list.

Corruption

Corruption is still a large problem in Egypt, which hampers the economy and acts as a barrier for foreign companies to invest in the country. In the global Corruption Perception Index of 2019 Egypt has a shared 106th rank when ranking for the lowest level of corruption, with a score of only 35, on a scale from 0-100 (low score indicates high corruption). Within Africa, Egypt has a shared 20th place, when ranking for the lowest level of corruption. In the enterprise survey conducted in 2016 by the World Bank, corruption was

¹⁴² International Monetary Fund - World Economic Outlook.

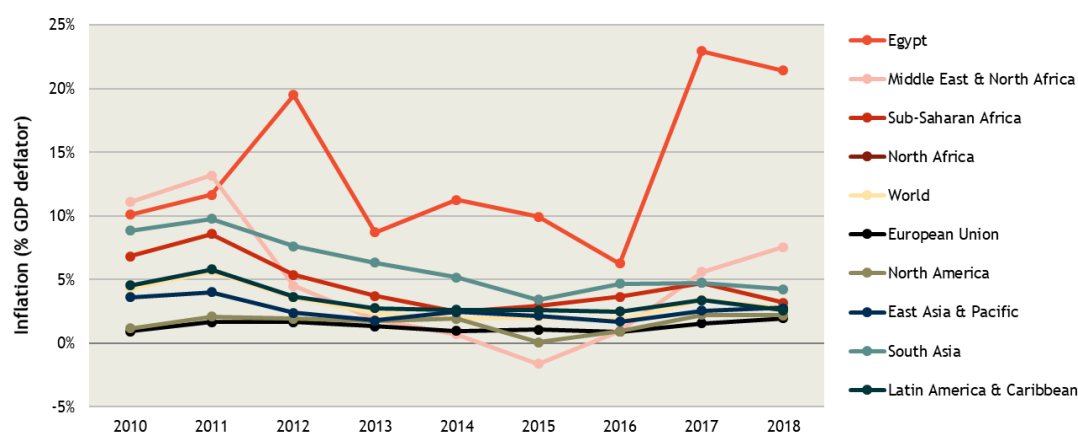
mentioned by 6.6% of the respondents as the most important obstacle to doing business in Egypt and by 68% of the respondents it was identified as a major constraint.

Financial stability

Inflation

Egypt has faced and is still facing strong inflation rates. The inflation compared to GDP has been on average, during the period 2010-2018. In order to reduce inflation, the Egyptian government has introduced several measures in 2016 to increase the stability of the country's currency, but these policies on the other side caused economic uncertainty for citizens, businesses and investors.

Figure B-32 Historical trends in inflation (GDP deflator %) in Egypt 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 twenty 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. On the high side of the spectrum, one country received an A- rating and three countries received a B+ rating. Egypt's S&P rating was B, meaning that the country performs according to the African average. The rating agency also thinks that the rating will improve in the future and rated its outlook as 'developing'. The rating agency Fitch is more positive about Egypt's creditworthiness and rated the country with a B+.

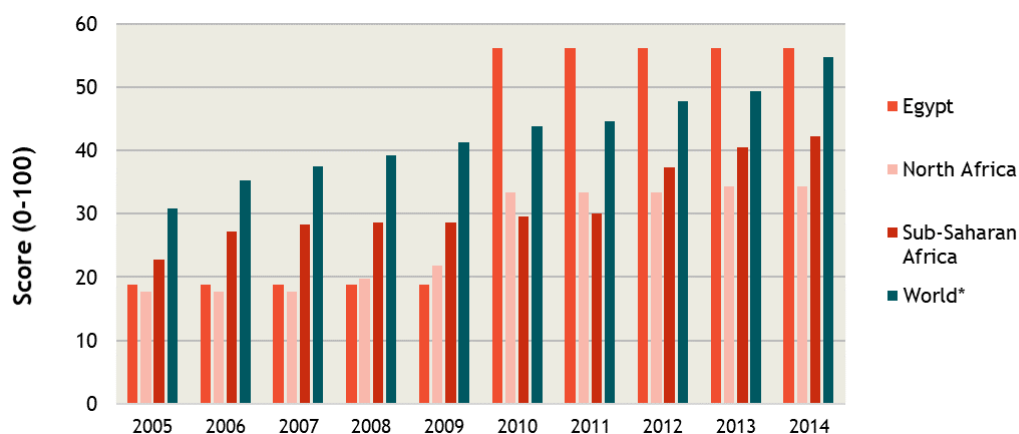
Table B-5 Most recent credit ratings by Standard & Poor's for African countries and their outlook (N=20)

S&P		Outlook	
A-	1	Stable	12
B+	3	Developing	4
B	10	Negative	4
B-	2		
BB	2		
CCC+	2		

Ease of getting credit

For a long time, access to finance has been a problem for people and organisations that want to start up a business in Egypt. However, due to political reforms introduced in 2008 the situation improved significantly. In the World Bank's indicator on the ease of getting credit Egypt's score jumped from under 20 (on a 0-100 scale) in the years 2005-2009 to over 55 in 2010 and since then it continued increasing slowly. It has to be noted, however, that in 2013 and 2016, the lack of access to finance was still mentioned as the largest obstacle to doing business in Egypt by 10% and 13% of the respondents, respectively.

Figure B-33 Egypt'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.

Existing awareness and capacities on CE in Egypt

Business /industries awareness

Awareness of the principles and the overarching concept of CE is increasingly gaining presence among Egyptian businesses and industry sectors. However, this development is for the most part happening in the entrepreneurship and start-up scene, facilitated by Initiatives such as the Start and Improve Your Business (SYIB) program led by the ILO. The initiative, which was conducted in cooperation with the Egyptian Micro Small and Medium Enterprise Development Agency (MSMEDA), included, among other things, a training program on “how to start a waste recycling business”.¹⁴³ Potential barriers for awareness raising in the various industry sectors are the low availability of specialised training, the missing technical support in many sub-themes of CE and the lack of the associated enabling environment (e.g. certain know-how about resource-recovery techniques and associated lab equipment, regulatory frameworks, trained human resources in the job market, etc.).¹⁴⁴

Consumer awareness of CE

Although Egyptian consumers in general show a high level of environmental concern and are resentful about the impact of poor waste management, awareness of CE and CE-related activities is still low. However, increased levels of consumer awareness can be measured in the area of solid waste management, where current awareness campaigns, for instance organised by MSEA in cooperation with different authorities, increasingly promote source separation of house-hold waste¹⁴⁵. Surveys indicate

¹⁴³ SwitchMed White Paper Egypt, 2018

¹⁴⁴ SwitchMed White Paper Egypt, 2018

¹⁴⁵ GIZ, Country report on the solid waste management in EGYPT, 2014, p. 26

that in terms of SWM practices, women are generally more knowledgeable than men because they are - in particular in low-income areas - more involved in the process of waste disposal. Consumer awareness of recycling activities and the corresponding economic and environmental benefits is on the other hand particularly present among students, who acquired the relevant information through television programmes, magazines and school activities such as seminars and research activities¹⁴⁶. Among the potential reasons for the lack of consumer awareness are the (so far) low level of consideration given by the authorities, the lack of access to information (e.g. in schools) and inadequate awareness raising efforts of the private and public sector^{147,148}.

However, it is worth noting that consumers in Egypt tend to implement CE practices in general, without labelling it as CE measures. This is due to the low-income levels and high cost of goods, thus, consumers in Egypt tend to extend the lifetime of their goods by applying repairing, maintenance and efficient operation techniques (to the extent possible).

Overview of awareness creation initiatives

Over the past year, a number of awareness creation initiatives were implemented and have initiated in Egypt. Initiatives explicitly addressing CE are scarce, as most initiatives do not directly reference CE as an overarching theme but instead address various layers of the waste management hierarchy across various sectors. The Ministry of Environment (MoE) generally seeks to increase environmental awareness by hosting diverse pieces of information on its own website. The website hosts supporting materials for recycling of agricultural waste (especially rice straws) as well as basic information about eco-design and lifecycle thinking based on ISO 14041¹⁴⁹. In addition, the MoE reportedly implemented an awareness campaign in 2014, which promoted source separation of household waste, with different authorities including civil society organizations, media outlets and schools but the results have not been made publicly available¹⁵⁰. From 2019 to 2022, the Deutsche Gesellschaft für Internationale Zusammenarbeit is implementing a project in Egypt, which seeks to develop digital information materials for social media to increase awareness among decision-makers and the general public about the role of the private sector in waste management¹⁵¹.

The United Nations Food and Agriculture Organisation (FAO) initiated an awareness campaign as part of the project on “Food Loss and Waste Reduction and Value Chain Development for Food Security in Egypt and Tunisia” (2015-2019) funded by the Italian Agency for Development Cooperation and implemented together with the Ministry of Agriculture and Land Reclamation. The project was implemented between 2015-2019 and focused on reducing tomatoes and grapes by means of sun-drying. In June 2018, the FAO announced the initiation of an awareness raising campaign, which was co-funded by the Egyptian Food Bank in order to reduce food wastages across the country. The campaign engaged with traders and hospitality sector in order to encourage the use rigid ventilated boxes and reduce the amount of food

¹⁴⁶ Milik S. Assessment of Solid Waste Management in Egypt during the Last Decade in Light of the Partnership between the Government and Private Sector. Cairo, Egypt: School of Humanities and Social Sciences, the American University in Cairo; 2010.

¹⁴⁷ National Action Plan for Sustainable Consumption and Production (SCP) in Egypt, 2015

¹⁴⁸ Ibrahim Mohamed Ibrahim & Abd El Monem Mohamed (2016), Towards Sustainable management of solid waste in Egypt (p. 345)

¹⁴⁹ <http://www.eeaa.gov.eg/ar-eg/%D8%A7%D9%84%D9%85%D8%B1%D9%83%D8%B2%D8%A7%D9%84%D8%A7%D8%B9%D9%84%D8%A7%D9%85%D9%89/%D8%A7%D9%84%D8%AA%D9%88%D8%B9%D9%8A%D8%A9%D8%A7%D9%84%D8%A8%D9%8A%D8%A6%D9%8A%D8%A9.aspx>

¹⁵⁰ GIZ, Country report on the solid waste management in EGYPT, 2014

¹⁵¹ <https://www.giz.de/en/worldwide/22230.html>

waste from oversized servings at restaurants.¹⁵² Apart from donor-funded activities, awareness campaigns have been mainly implemented by stakeholders from the private sector. Accor, a French multinational hospitality company, launched a Green Star challenge “Planet21” in 2019 in order to encourage hotels operating under its holding to reduce food waste. Many Egyptian hotels participated and created awareness amongst hotel guests on the environmental impacts of food production and excessive food waste¹⁵³.

Furthermore, the Egyptian government is supporting various awareness raising campaigns to address the country’s growing water scarcity by sensitizing consumers and industries about reduction, reusing and recycling of (waste) water. As part of the 164 million EUR project “Kafr El-Sheikh Wastewater Expansion Programme”, the European Bank for Reconstruction and Development (EBRD) provided a budget of 150,000 EUR to a dedicated awareness raising campaign in 2016¹⁵⁴¹⁵⁵. In 2018, the Egyptian government signed an agreement with the European Union for better water management, covering CE-related issues such as reuse of waste water after treatment in sewage treatment plants, however, awareness raising does not appear to be a major component of these projects¹⁵⁶. More recently, in March 2019, the Egyptian Holding Company for Water and Wastewater (HCWW) launched a campaign to rationalize water consumption across the country. Implemented under the slogan of “Every Drop Counts”, the campaign ran for a week from 22-28 March in 24 villages across all of Egypt and involved various ministries and governmental bodies in order to raise awareness of water usage¹⁵⁷.

One example for awareness creation activities explicitly related to the CE concept is “EduKid-CE”. The project was initiated as a seed funding program following “Frontiers of Engineering for Development (FoEDev) Circular Economy Symposium” organized by the Royal Academy of Engineering in 2018 in London. The main goal of EduKid-CE project was to create a hybrid (electronic and traditional learning) educational platform to promote the concept and values of CE to younger generations. Led by University College London (UCL) and mentored by the Circular Economy Club, the project engaged experts from various countries in North Africa, including Egypt. In total, six after-school workshops were held in Egypt through which students were introduced to the topic of CE as well as other related issues (e.g. recycling, biomimicry, climate change, water scarcity and pollution). The project was concluded in March 2019¹⁵⁸.

National capacities on CE

Egypt’s National Action Plan (NAP) for Sustainable Consumption and Production from 2015 highlights the role of capacity building in the context of CE-related activities. Developed and funded as part of the EU’s SwitchMed Programme, the NAP acknowledges “the need to make a qualitative shift towards green circular economy as a means to achieve sustainable development”¹⁵⁹. As such, the NAP recommends developing a capacity development program across different priority sectors, namely agriculture, water management and solid waste management¹⁶⁰.

¹⁵² <http://www.fao.org/neareast/events/view/ru/c/1137468/>; <https://www.developmentaid.org/#!/news-stream/post/31737/reducing-food-loss-and-waste-egypt>

¹⁵³ <https://greenstars.accor.com/hotels/awareness-campaign-about-food-waste/>

¹⁵⁴¹⁵⁴ <https://www.water-technology.net/projects/kafr-el-sheikh-wastewater-expansion-programme-keswe/>

¹⁵⁵ <https://www.developmentaid.org/#!/tenders/view/240994/kafr-el-sheikh-wastewater-expansion-programme-awareness-raising-campaign>

¹⁵⁶ <https://www.afrik21.africa/en/egypt-cairo-signs-agreement-with-eu-on-better-water-management/>

¹⁵⁷ <https://egyptindependent.com/egypt-launches-campaign-to-rationalize-water-consumption/>

¹⁵⁸ <https://edukid-ce.exposure.co/edukidce?fbclid=IwAR3VhChAoV7iqrhUTD1PFAio-U9zLH1XYiNxmI91JvGbu9XgOXUb7VcWo>

¹⁵⁹ <https://www.switchmed.eu/en/documents/egypt-scp-nap-docs/01-scp-national-action-plan-egypt.pdf>; page 22

¹⁶⁰ Ibid. page 4

With regard to agriculture, the main challenges related to CE and highlighted by the NAP include inefficient and unsustainable irrigation practices (with 85% of Egypt's water going into agriculture), unexploited opportunities to utilise agricultural waste for production of biofuel and organic fertilizers, excessive use of synthetic fertilizers and pesticides as well as unsustainable food consumption (food waste)¹⁶¹. Challenges in water management mainly pertain to the insufficient use of non-conventional, renewable water resources (e.g. agricultural drainage, recycled industrial wastewater or desalinated seawater)¹⁶².

As for solid waste management, municipal solid waste collection and disposal remain unresolved issues, emphasising the need for new policies to face the increasing volume of waste and corresponding health hazards. In 2014, the government of Egypt published the Draft National Strategy of Integrated Solid Waste Management and recommended to adopt an integrated approach. In this context, capacity building is understood as one of several key pillars, yet further specifications as to what capacities are to be built are not referenced¹⁶³.

Based on discussions held during a Horizon 2020 Capacity Building/Mediterranean Environment Program on "Solid Waste Management with particular focus on private sector participation" hosted from 7th-9th of December 2011 in Morocco, experts agreed that "capacity building programmes are needed for all the staff dealing with municipal solid waste management" in Egypt¹⁶⁴. Owing to the absence of an effective legislative framework in the solid waste management sector, training of human resources in public administrations to deal with technical, regulatory and financial aspects of relevant waste streams is of highest priority and should seek to support the creation of economic instruments, which allow for the involvement of private sector via (e.g.) public-private-partnerships¹⁶⁵.

Due to the existence of a wide-spread informal sector, which operates in absence of a specific legislation on solid waste management, the analysis recommends building the capacities of the country's informal workforce in order to organise them and integrate it into the formal solid waste management system. Lastly, financing institutions were found to be underequipped to evaluate the feasibility and profitability of solid waste management projects and should thus be supported by international development organisations in developing the necessary capacities for evaluation¹⁶⁶.

Education and skills gaps

The institutional framework for education and training in Egypt is highly complex. It encompasses over 30 different institutions and authorities. The two ministries, which hold a direct mandate for developing and administering the country's education and higher education portfolios, are: The Ministry of Education and the Ministry of Higher Education. In addition, five other ministries share responsibility in the area of vocational training: the Ministry of Trade and Industry, the Ministry of Housing, Utilities & Urban Communities, the Ministry of Manpower, Health and Population, and the Ministry of Social Solidarity.

¹⁶¹ Ibid. page 43-48

¹⁶² Ibid. page 49-52

¹⁶³ Ibid. 53-55

¹⁶⁴ https://www.retech-germany.net/fileadmin/retech/05_mediathek/laenderinformationen/Aegypten_RA_ANG_14_1_Laenderprofile_sweet_net.pdf

¹⁶⁵ Ibid.

¹⁶⁶ Ibid.

Other important stakeholders include the National Authority for Quality Assurance and Accreditation in Education, three sectoral training councils and the Micro Small and Medium Enterprise Development Agency (replacing the former Social Fund for Development)¹⁶⁷. Notably, there is an absence of the Ministry of Environment in inter-ministerial consultations related to educational programs. This reduces the prospects of integrating sustainability and circularity aspects into Egypt's educational and vocational training development agenda¹⁶⁸.

According to analyses carried out by the European Training Foundation (ETF), Egypt's educational and vocational training system traditionally suffered "from the involvement of many authorities, over-centralisation, underfinancing, low quality and overreliance on uncoordinated donor support for restructuring and reform efforts"¹⁶⁹. More recent analyse by ETF suggest that continuous efforts by the Egyptian government to expand accessibility to education have resulted in improving education outcomes with an enrolment ratio of 97.45% and 85.49% for primary and secondary education, respectively. Overall, the quality and relevance of education in Egypt remains generally weak as the system does not deliver the necessary learning outcomes, skills and competencies for successful transition to the job market¹⁷⁰.

In order to address the country's most pressing environmental and CE-related challenges, the Egyptian government has undertaken a number of measures, which increase the skills and knowledge base of its population. In 2017 the GoE through Ministry of Education and Technical Education launched the Education 2.0 (2018-2030) along with the initial set of related ministerial decrees. Education 2.0 strives to make the education system more relevant for the socio-economic development of Egypt. The Ministry of Environment further implemented the Pollution Abatement Programme to help industry improve performance and comply with environmental regulations. It is now in its third phase running from 2015-2020. Touching upon a number of CE-related issues (including resource efficiency, cleaner production and hazardous waste management amongst others), the programme has so far trained some 1500 candidates including regional managers, factory workers and auditors.¹⁷¹¹⁷² Past initiatives with CE-related capacity building components included the Support for Environmental Assessment and Management (SEAM, completed in 2004)¹⁷³ Programme and the Environmental Sector Programme (ESP, completed in 2008)¹⁷⁴. In addition, a number of institutions promote the adoption of cleaner production measures across Egyptian industries through dedicated capacity building activities. These include the Industrial Modernization Centre¹⁷⁵ and the National Cleaner Production Centre¹⁷⁶ as well as the Environmental Compliance Office.¹⁷⁷

With regards to higher education, universities implicitly address CE-related issues as part of industrial engineering programmes. One example is Alexandria University, which offers courses on Solid Waste

¹⁶⁷https://www.etf.europa.eu/sites/default/files/m/88A82E26E3A48905C12579130031E714_Education%20and%20Business%20Study%20-%20Egypt.pdf

¹⁶⁸https://www.ilo.org/wcmsp5/groups/public/---africa/---ro-addis_ababa/---sro-cairo/documents/publication/wcms_243765.pdf

¹⁶⁹https://www.etf.europa.eu/sites/default/files/m/C12578310056925BC12570FF00390EC4_NOTE6LBE7D.pdf

¹⁷⁰<https://www.etf.europa.eu/sites/default/files/2019-03/Egypt%202018.pdf>

¹⁷¹<http://industry.eeaa.gov.eg/>

¹⁷²https://www.ilo.org/wcmsp5/groups/public/---africa/---ro-abidjan/---sro-cairo/documents/publication/wcms_243765.pdf

¹⁷³<http://www.eeaa.gov.eg/en-us/mediacenter/reports/projectstudies/seam.aspx>

¹⁷⁴<http://www.eeaa.gov.eg/esp/Publications.asp>

¹⁷⁵<http://www.imc-egypt.org/>

¹⁷⁶www.encpc.org

¹⁷⁷<http://www.fei.org.eg/index.php/en/units/eco/101-units/eco>

Management and Advanced Wastewater Treatment.¹⁷⁸ More holistic higher education programmes are offered by Heliopolis University for Sustainable Development. Established by SEKEM in 2009, the university implements sustainable and CE-related campus practices through wastewater treatment for irrigation purposes and “conscious waste management and recycling”.¹⁷⁹ The curriculum of the university’s “core program” relates to the same principles.¹⁸⁰ Apart from such individual examples however, CE has not yet been adopted as an integrated topic across Egypt’s TVET and higher educational landscape. However, the GIZ is currently launching a new education training program with universities, establishing new courses on state-of-the-art technologies and business models, with CE being leading principle in the following 3 local universities: Ain Shams University in Cairo, South Valley in Qena and Technological university of New Cairo.

The EU is a strong supporter of the Egyptian Education sector as a whole, and is particularly focusing on increasing access to, and quality of, education for the most vulnerable children. The EU has also been supporting the modernisation and quality enhancement of the Egyptian HE, notably through ERASMUS+, where the EU has funded 2,410 mobilities from Egypt to Europe and 1,087 from Europe to Egypt since 2014. The 2019 selection included more than 1,200 new participants in both directions. ERASMUS+ offers a good opportunity to increase the knowledge transfer on CE between both parties and boost CE-related capacities of the HE-sector in Egypt.

¹⁷⁸ <https://www.masterstudies.com/M.Sc.-in-Environmental-Engineering/Egypt/Egypt-Japan-University-of-Science-and-Technology/>

¹⁷⁹ <https://www.sekem.com/en/cultural-life/heliopolis-university/>

¹⁸⁰ <https://www.hu.edu.eg/core-program/>

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

Waste Sector

1. National Solid Waste Management Program (NSWMP)

NSWMP was setup to support the Ministry of Environment in Egypt through its Waste Management Regulatory Authority (WMRA) in the establishment of new and effective policies, legislation and institutional arrangements for waste management at the national level in Egypt, coupled with an investment pipeline for implementation of sectoral projects at the regional and local level. This program is co-funded by national and international funding institutions that include GIZ, KfW and the European commission. The geographical scope of the programme covers 2 governorates in Upper Egypt (Assiut and Qena) and 2 governorates in the delta region (Kafr El Sheikh and ElGharbia). The programme aims to employ advanced waste management tools and restructure the waste management sector through the following¹⁸¹¹⁸²:

- Establishment of a national dialogue on the development of the strategic and political framework, where a national waste policy has been developed in consultation with all relevant stakeholders and submitted to the ministry of environment
- Construction of the necessary infrastructure of waste treatment, recycling, composting, production of refuse derived fuel (RDF), transfer stations and final disposal facilities
- Organization of networking between the relevant actors in the waste sector through a forum, and an internet platform is under development
- Providing consulting services related to the preparation and implementation of the programme, transfer of know-how by international and national consultants to provide technical support on matters related to waste management
- Piloting of operator models for collecting and recycling of waste in 4 pilot governorates in urban and rural zones.
- Establishment of the necessary infrastructure for waste treatment, recycling, composting, production of RDF (Refuse - Derived Fuel), disposal facilities and transfer stations, supplying mobile equipment for primary and secondary waste collection and transportation, in addition to the closure of existing dumpsites.
- Examining alternative financing models for waste management, for example Extended Producer Responsibility (EPR).

The EU contribution to the NSWMP project comprises a EUR 20 million grant, including a EUR 10 million grant contribution from the Neighbourhood Investment Facility (NIF) aimed at the governorate of Kafr el-Sheikh, Gharbia, Assiut and Qena. A key pillar of the project is the establishment of the Egyptian Waste Management Regulatory Authority, which provides new services for the waste sector in cooperation with existing actors. The governorates are supported in their implementation of the respective Waste Management policies and legislation through the project.

¹⁸¹ Source: Egypt's first Biennial Update report, 2018

¹⁸² Source: National solid waste management program (<https://nswmp.net/about-nswmp/>)

2. Executive plan for solid waste recycling (2019 - 2023) (Public Sector)

This 5-year plan consists of three main programs, that has been agreed upon by ministries and relevant institutions. The first programme aims at attracting investments to develop the infrastructure. The first has set the following targets that are deemed to be relevant to circular economy:

- Elimination of 62 unlicensed landfills,
- Establishment of 94 waste sorting facilities (including 65 mobile ones),
- Establishment of and 63 recycling lines

The second program aims at funding the contracts of garbage collection and transportation, street cleaning services, and management of safe landfills, and the third program is about institutional support embodied in institutional development of the waste recycling system across the country, human capacity-building, awareness campaigns, and support for the informal sector and SMEs in the recycling sector.

3. Ethadar Lel Akhdar

Ethadar lel Akhdar Campaign (Prepare for the green-prepare for the future) is a new campaign launched by the EEAA. The campaign aims to spread environmental awareness, change behaviours and urge citizens to participate in preserving the environment and natural resources to ensure achieve sustainability and preserve the rights of future generations, during a period of 3 years starting from January 2020. The campaign aims to spread awareness on 8 main topics: afforestation, waste, rationalizing food consumption, rationalizing energy consumption, limiting the use of plastics, preserving marine creatures, reducing air pollution and the protection of natural protected areas. It aims at connecting successful initiatives in sustainable development, engaging community, creating job opportunities among small producers in rural areas for big producers to source their raw material from. Danone and Chipsey factories for example are currently sourcing their raw materials from small villages by training them to meet their specific needs and standards for production and avoid food losses. Several NGOs are also participating through this campaign, by mapping of local communities' opportunities and linking them to the business investors (**mapping by region and competitive advantage in each governorate in Egypt**) is important.

4. Waste Marche (Private Initiative)¹⁸³

This is a new online platform for industrial waste management operated by Waste Marche LLC. It was established early in 2019. It acts as a platform for the trading and management of industrial wastes and by-products between industrial producers and other stakeholders in the chain. It is first online platform in the Middle East and Africa for scrap and recyclables, where waste generators can post their wastes online (including pictures, specs, and other important info) and receive offers from the registered waste buyers. If the waste does not have a selling value, the waste generator can then request a waste disposal service (including pictures, specs, and any special requirements) and will get technical and financial offers from the registered waste management service providers. The waste generator will be able to compare the offers through his dashboard and can accept or decline the offers online. Waste Marche representatives are open to discuss further opportunities and details on their services under this project. This initiative tackles problems in the industrial waste management system in Egypt, which could be highlighted in the following points:

- Most of the wastes are being disposed of for landfilling, since no other disposal methods are explored or because of the high cost of their recycling/recovery

¹⁸³ <http://www.wastemarche.com>

- No market for the industrial wastes
- Scrap is sold below the market prices
- Waste management service providers cannot find the customers

5. Tagaddod (Private Sector)

Tagaddod (Arabic term for “renewal”) is a renewable energy and waste management company that was initiated in year 2013 and operates in Cairo. Currently focusing on clean fuels, Tagaddod is working on Bio-diesel production from Waste Vegetable Oil (WVO). They provide the following services:

- Used cooking oil collection
- Used cooking oil refining to produce biodiesel
- Distribution and exporting of biodiesel.

The company’s production capacity of biodiesel is around 300 tons per month.

It is worth mentioning that 95% of Tagaddod’s biodiesel is exported to the EU countries. ¹⁸⁴

6. Bariq (Private Initiative)

Bariq is the first “bottle-to-bottle” company in the MENA region, where they produce recycled polyethylene terephthalate (RPET) pellets from post-consumer plastic PET bottles, that would have otherwise been disposed of in the landfills. These pellets are proudly approved by international regulators including the U.S. Food and Drug Administration (FDA), the European Food Safety Authority (EFSA), REACH and Health Canada. These PET pellets are then used to provide food-grade pellets to major international bottle and food container manufacturers and major recycled-material fibres producers throughout Europe and the United States.

7. SEKEM Holding (Private Sector)

SEKEM is a large organization with several activities, including trading companies for produce and processed foods (Hator and Libra), herbal teas and beauty products (ISIS Organic), medicinal herbs and medicines (ATOS Pharma), and organic cotton products (NatureTex). SEKEM currently runs its own waste separation and waste management on the main farm already for a long time. Now it is explicitly about banning plastic waste completely or reusing it multiple times as a precious resource. SEKEM’s Vision Goals for 2057 include: Zero waste and circular economy. The zero-waste goal envisages shifting to alternative packaging materials and innovating the recycling system of SEKEM. This goal could be considered a circular economy action in the design phase.

Also, SEKEM’s Vision Goal no. 12 for 2057 is built around a concept in which the basic understanding is to care for the prolonged existence of products and to consume and produce only according to real needs, which ultimately achieves circular economy objectives¹⁸⁵.

8. Egyptian Green ICT Strategy (Public Sector)

The Egyptian Ministry of Communications and Information Technology, in collaboration with the Egyptian Ministry of Environment, has adopted a Green ICT strategy with a vision of mainstreaming green ICT within all sectors in Egypt. The strategy worked on the following objectives, that aim to achieve circular economy:

- Developing a national e-waste management program
- Creating new job opportunities in the green ICT field
- Raising community awareness on green ICT

¹⁸⁴ <https://www.tagaddod.com/>

¹⁸⁵ <https://www.sekem.com/wp-content/uploads/2019/06/SEKEM-Report-2018-EN.pdf>

- Mainstreaming of green ICT across different sectors of the economy

The strategy accomplished several achievements, that included:

- Establishing the first ITG E-waste recycling facility in Egypt and the middle east
- Launching of e-waste recycling campaign
- Developing green ICT portal
- Developing guidelines booklet on the procurement of sustainable IT products (with the world bank)

There are still future plans to build capacities and skills in the green ICT field, develop green ICT youth incubators and provide new job opportunities in the green ICT field.

9. IWEX (by ENCPC)

IWEX project is a Green Growth Industrial Waste Management and SMEs Entrepreneurship HUB in Egypt. It is implemented by the Egypt National Cleaner Production Centre (ENCPC), which is affiliated to the Ministry of Trade and Industry. The project aims at establishing a national industrial waste exchange system in Egypt by linking industrial waste generators, potential users & recyclers. The project promotes the development of new innovative SMEs and contributes to the development of policy measures for regulating market. It was composed of the following components:

1. Mapping of the industrial waste at the enterprise level in 2 selected pilot industrial areas (10th of Ramadan city and 6th of October city)
2. Developing policy recommendations towards an enabling environment for industrial waste exchange
3. Raising Awareness and Building Capacities of Stakeholders
4. Support Entrepreneurship Development

The online industrial waste exchange platform (www.iwexegypt.com) posted materials available for sales, requests for materials and browsing lists of materials by type and industrial zone. 184 companies registered in this platform, with 65 requests of selling/buying of materials and 45 business opportunities were created. The ministry of industry is currently exploring potential modalities to manage and operate the platform.

Agriculture Sector

All the sectors' strategies and action plans in the agriculture sector primarily target the rationalization of water and energy consumption in agriculture activities, recycling of agricultural wastes and utilizing renewable energy sources in agricultural activities, which are directly interlinked to circularity. There are several strategies adopted by the Egyptian government (Public Sector) that address circularity in a number of objectives and targets. There are also several initiatives and programs that achieve circularity under the agriculture sector as follows:

1. Sustainable Agriculture Development Strategy (SADS) (Public)

The Egyptian government adopted the SADS in 2009 to address the challenges facing the agricultural sector, with the following set of objectives that interlink with circular economy:

- Sustainable use of natural agricultural resources by enhancing efficiency of water consumption efficiency in irrigation, expansion of reclaimed areas, increasing crop yield productivity, maximizing the use of rainfed agriculture, and protecting agricultural land from encroachment and degradation of soil fertility
- Increasing agricultural productivity through productivity improvement of field and crops and resistance to drought, salinity and pests, increase meat and milk yield to meet the

rise in per capita animal protein consumption by developing cattle, buffalo, poultry and fisheries production;

- Raising the degree of food security of the strategic food commodities by promoting self-sufficiency, improving nutritional standards and dietary patterns, enhancing food quality and safety
- Implementing post-harvest best practices to reduce food losses and waste and improve the crops quality. The government has been introducing new trends to improve post-harvest handling procedures, such as storage of wheat in plastic silos, and conversion of food waste into biomass to increase. However, there are still several measures that need to be taken to reduce food losses and waste from the agriculture sector.

2. Utilization of Agricultural residues as alternative fuels in Cement Plants (Public)

The Egyptian Ministry of Environment applied changes to the executive regulations of the environmental law in Egypt (law 4/1994) to oblige cement plants to use agricultural residues as a part of their thermal consumption plant in their production processes. This law enforcement has led to the creation of a market for agricultural residues in Egypt, and shifted the farmers' paradigm to create profit of their agricultural residues (rice straw, cotton stalks, olive pits...etc) and save the environment at the same time, since the farmers used to burn these agricultural residues or dump them in water ways.

3. IMKAN project for Agricultural Wastes (Launched by the UNIDO)

IMKAN project is located in Luxor governorate (in Upper Egypt); a project Funded by Japan and jointly implemented with Egypt's Ministry of Trade and Industry. Their activities involve converting sugar cane straw; amounting to more than 1.5 Mtons per year into a tradable and valuable resource demanded by the market - thereby generating income for farmers and businesses for entrepreneurs. Farmers sell residues to entrepreneurs who convert it into high protein organic animal feed, which is sold to livestock producers. Additionally, the waste from the sugarcane mills is used to produce organic fertilizers which is then sold on to farmers. A very good example of circularity¹⁸⁶.

Tourism Sector

Tourism sector in Egypt is actually one of the pioneer sectors in Egypt in adopting sustainable development practices and the government continues to push through with efforts to revamp and improve the sector.

Since 2014, the Egyptian Ministry of Tourism has been putting a lot of its efforts to develop its sustainable development agenda; in support of the national sustainable development goals of the SDS 2030, where they established the Green Tourism Unit to help build the institutional capacity within the Ministry, co-invest with hotels in energy efficiency and renewable energy projects and set the guidelines for the new development/constructions in hotels sector. The Egyptian Ministry of Tourism has also launched its Reform Program in 2018 that aims to achieve sustainable tourism through implementing structural reforms that strengthen the sector's competitiveness in line with international standards. Pillars of this structural reform include institutional reforms, legislative reforms, promotion and marketing reforms, infrastructure & tourism development reform and global tourism trends. Within these pillars, the ministry aims to redefine partnership with intergovernmental organizations and foreign development agencies to work towards achieving the Sustainable Development

¹⁸⁶ Source: UNIDO activities in Egypt 2017 - 2018

Goals. In addition, the global tourism trends pillar involves branding Egypt as a responsible destination with recognized and environmental and social standards.

Additionally, the Green Star Hotel (certification and capacity building) program has been established in 2012 as a project of major Egyptian and German stakeholders, with the aim of raising awareness on green tourism and rewarding environmentally friendly practices by adhering to environmental and social prerequisites. It is managed by the Egyptian Hotel Association (EHA) under the patronage of the Egyptian Ministry of Tourism. It was developed to encourage local hotels to adhere to international environmental and social standards to increase their competitiveness in green hospitality while also reducing carbon footprint as a by-product. Such standards cover measures that include energy efficiency, renewable energy, water savings, solid waste management and other standards that are related to the hotel operation. However, there is still potential in expanding their network to complement more elements value chain of the tourism sector such as transportation, tour operators, and archaeological sites, and the GSH are interested to grow in such directions. As of now, there are 80 hotels in Egypt with approximately 20,000 rooms in 15 destinations over Egypt are Green star certified.

This certification enables these hotels to be internationally recognized for raising their environmental performance and social standards while reducing their operational costs.

The GSH program supports the following SDG goals:

- SDG 8: Decent work and economic growth (Strongly linked to the contribution of CE goals)
- SDG 11: Sustainable Cities & Communities (Indirectly contributing to CE goals)
- SDG 12: Responsible consumption and production (Strongly linked to the contribution of CE goals)
- SDG 13: Take urgent action to combat climate change & its impacts (Achieving the target will contribute towards enhanced CE goals)
- SDG 14: Life below water (Indirectly contributing to CE goals)

Certified GSH hotels eventually achieve the following targets:

- a. Decreased operational costs as a result of lower utility costs (water, energy and waste management) and improved operational efficiency (using monitoring tools)
- b. Increased competitive advantage as follows:
 - Higher visibility for environmentally conscious guests and tour operators
 - Local and international recognition for environmental sensitivity
 - Demonstration of sustainable and social responsibility
- c. Received professional guidance and training
 - Access to customized training and guidance to achieve the GSH award
 - Access to professional online tools (monitoring, marketing, staff instructions, etc)

It can be concluded that there is a very strong potential to enhance circular economy practices in the tourism sector, specifically within in the GSH program.

Another highlight related to green tourism is “Green Sharm El Sheikh” project. The project aims at transforming Sharm El Sheikh city into a “model integrated and ecologically sustainable tourism city of national and international importance through the adoption of low-carbon technologies, good waste

management practices and further enhanced protection of its natural capital basis”¹⁸⁷. The project consists of the following 3 components, and the financing type is technical assistance:

1. Enabling framework for a green sustainable tourism city
2. Reducing GHG emissions in targeted urban zones
3. Extend biodiversity protection from Sharm El Sheikh city to key adjacent sites and ecosystems

The fund received from the GEF directed towards technical assistance (pilot projects, feasibility studies and action plans). However, further support (financial) is required for the implementation of the action plan that will be developed.

Industry

1. Egyptian National Cleaner Production Centre (ENCPC)

ENCPC was established as a service provider for the Egyptian Industry in 2005 by the Ministry of Industry and Trade and SMEs in cooperation with the UNIDO as a part UNIDO/UNEP global network for NCPCs/NCPPs (51 centres) and part of the Egyptian Industrial Council for Technology and Innovation. It was established with support from the Swiss government, the Austrian government, and the Egyptian government. It provides several services to the industrial facilities with the aim of achieving resource efficiency (Water, energy, and materials), cleaner production, transfer of environmental sound technology (TEST projects), industrial waste valorisation and supporting green entrepreneurship in industrial sector. It implemented several projects with different development corporations and DFIs that support in achieving CE objectives, such as:

- Utilizing Solar Energy for Industrial Process Heat in Egyptian Industry in partnership with UNIDO and GEF
- Green Growth: Industrial Waste Management and SME Entrepreneurship Hub in Egypt in partnership with African Development Bank and MENA-Transition Fund
- Fostering Renewable and Sustainable Energy in Africa through R&D “FORWARD” in partnership with African Union and the EU

ENCPC achieved the following results from 2015 to 2018 among industrial facilities:

- Water savings of 2.5 m3/year
- Energy savings of 450 GWh/year
- CO2 emissions reductions of 85 tons/year
- Solid waste reduction of 15,000 tons/year

2. Industry and Trade Development Strategy 2016 - 2020 (Public)

The Egyptian Ministry of Industry prepared a 5-year strategy to be the driver of sustainable and inclusive economic development, meeting domestic demand and enhancing exports growth. This vision emerges from the economic pillar of Egypt’s SDS 2030, which is the overarching strategy in Egypt for all economic sectors in Egypt to develop in consistency with. It is made up of the following 5 main pillars.

¹⁸⁷ https://www.thegef.org/sites/default/files/web-documents/10117_PIF.pdf

Figure C-1 Main pillars of the industrial development strategy from 2015 to 2020



This strategy aims contributes to circular economy through the adoption of the following activities:

1. Increasing reliance on new and renewable energy resources in the industrial sectors, and recycling of industrial wastes and providing market
2. Integrating recycling industries (industrial and agricultural wastes) in the local value chains
3. Supporting industries that contribute to green economy
4. Enhance the competitiveness of Egyptian exports by providing specialized technical services to energy intensive industries such as cement and fertilizers to enhance their energy efficiency, reduce their energy costs, utilize alternative energy sources such as biomass residues and RDF

The strategy identified some projects that are deemed to be relevant to circular economy:

1. Green Economy Development Project: a project that supports industries contributing to green economy, industries with low emissions, and industries based on environmental dimensions, such as waste recycling industries, whether industrial or agricultural waste, focusing on enhancing exports that comply with environmental standards, which is now a primary condition for exporting.
2. Egyptian Exports Competitiveness Enhancement Project by providing specialized technical services for energy savings, particularly in energy intensive industries, such as fertilizers and cement production industries, as well as in small and medium industries. Such service shall reduce costs and enable compliance to energy and environment international standards; encourage investment and usage of alternative energy sources, especially those dependent on industrial and agricultural waste recycling; and support reaching acceptable standards for energy saving in production machines.

3. Industrial energy efficiency Project (UNIDO, Donor: Global Environment Facility)

The Industrial Energy Efficiency (IEE) project aims to promote efficient use of energy by industry, strengthen policy frameworks, disseminate best practices and technologies to accelerate economic growth and enhance competitiveness and job creation, all the while mitigating climate change. The project supported 12 industrial sectors in adopting Energy Management Systems in accordance with the international standard ISO 50001. An example on the outputs of the project is a petrochemicals company in Alexandria (SIDPEC) that produces plastic material for packaging, with 50% of its production targeting international markets. Throughout a three years period, UNIDO helped the company to establish and implement a systematic energy management system to improve its energy efficiency and energy consumption using low cost measures to convince staff of the potential

benefits of implementing the energy management system. The Energy Management System was implemented over a one-year period, after identification and implementation of specific opportunities for system optimization. Currently, the company is estimated to achieve energy savings reaching around 40,000 MWh with GHG emissions reductions reaching 100,000. The UNIDO IEE project has also prepared 4 benchmark reports in the cement, iron and steel, fertilizers and ceramics sectors in Egypt, which identified energy saving opportunities in each sector.

Furthermore, the awareness component of the project established a national campaign (Kafaa) to improve understanding amongst industrial manufacturers regarding the concept of energy efficiency and the economic benefits of energy management and system optimization. The campaign reached more than 500 companies across Egypt.

4. Switch-Med: transfer of environmentally sound technology in the South Mediterranean (UNIDO, Donor: European Commission)

The regional Switch Med Project connects industry, SMEs, emerging green entrepreneurs, civil society and policy makers across the Mediterranean to promote social and environmental innovations and support patterns of Sustainable Consumption and Production (SCP) through demonstration activities, policy development and networking of incubators for eco innovations. MED TEST II is the first component of the Switch MED programme that aims to turn challenges into opportunities using a unique methodology that transfers environmentally sound technologies (TEST), to address rising energy and raw material costs by demonstrating how best practices in Resource Efficient and Cleaner Production (RECP) with an attractive return on investment, and achieve circular economy.

MED TEST II was implemented together with the Egypt National Cleaner Production Centre (ENCPC) that is affiliated to the Egyptian Ministry of Trade and Industry. The project supports industrial facilities in taking the necessary steps to introduce effective monitoring systems and upgrade their existing ISO certifications. Priority sectors and geographical locations on which to focus are selected in close consultation with national authorities, which resulted in 28 companies ranging from SME to large companies operating in **food and beverage, chemicals, organic fertilizers and textile sectors** were selected for the MED TEST II demonstration phase. The demonstration projects proved the potential for Resource Efficient and Cleaner Production within industry to generate valuable savings both for companies as well as for the national economy, even by introducing small measures with a short payback period. The majority of the identified measures in Egypt had a payback period of less than half year. MED TEST III in Egypt is planned to address CE in the value chain of textiles sector (not launched yet).

Subcomponent 2 entitled “Green entrepreneurship and civil society empowerment” aimed at strengthening green entrepreneurship among Mediterranean countries and empowering the civil society organizations of these countries towards more sustainable living. This is realized through capacity building and training programs that target green entrepreneurs and civil society organizations to progress towards a more sustainable living by providing the basic requirements for the development of sustainable business solutions, complemented by market opportunities and business ideas by green entrepreneurs. For example, on the green entrepreneurship output, the ENCPC in collaboration with Nahdet El Mahrousa (local NGO) were chosen to be the local implementing partners for the green entrepreneurship programme; where 12 local trainers were trained on the utilization of the SWITCH-MED methodology and tools, which then disseminated the training over 13 workshops. A total of 252 green entrepreneurs were

trained to develop and test their green business models, where 25% of the trainees were women. Afterwards, 16 entrepreneurs have been selected to receive individual coaching to further improve their green business models, where 19% of them were women, to be admitted to the incubation phase. Finally, 5 green entrepreneurs were chosen to support the development of the green business models during 8 - 16 months and establish their own companies.

Subcomponent 3 entitled “SCP National Action Plans demos” aimed at implementing demonstration activities under the National SCP Action plan developed by participating countries in the SWITCH-MED project. One of the demonstration projects that contribute to the implementation of Egypt’s National SCP action plan that was developed under SWITCH MED project is the **National initiative on reduction of plastic bags consumption**. The initiative was launched by the Minister of Environment on the 5th of June in 2017, where alternatives to single-use plastic bags (multi-use bags) were distributed in big grocery chains in Egypt in Cairo and Alexandria governorates and also in Sharm El Sheikh city during the convention of biological diversity that took place in November 2018.

5. Industrial Pillar in Egypt’s Integrated Sustainable Energy Strategy to 2035

The energy strategy 2035 provided an outlook for Egypt’s future energy system, including energy utilization in the industrial sector. The strategy proposed the utilization of biomass residues and refuse derived fuel (RDF) to substitute a portion of the thermal energy utilized by cement plants. The strategy also involved the improvement of energy efficiency through the adoption of national policies.

6. Better Cotton Initiative (BCI) (UNIDO)

The UNIDO has launched a pilot program in the Egypt to support the Egyptian Cotton branding as part of a renewed drive to increase product sustainability, improve working conditions along the industry’s supply chain, and support cotton growers and relevant institutions in paving the way towards the pilot’s national upscaling. It promotes the production of non-contaminated long staple and extra-long staple cotton in addition to the organic cotton by enhancing the social and environmental performance of cotton growers and processors and strengthening support institutions. The project aims at achieving sustainable development of the cotton industry through several activities which correlate to circular economy:

- Improving the technical skills, economic performance and sustainable agricultural practices of cotton growers
- Deploying demonstration plots to support the implementation of sustainable agricultural practices such as organic plantation, low crop contamination and efficient water, fertilizers and pesticides utilization.
- Benchmarking national guidelines in the Egyptian cotton sector to compare it against international market standards in collaboration with the cotton research institute of Egypt.
- Raising awareness of the textile industry (from managerial to technician level) on environmentally sustainable practices
- Investing in innovative solutions to design sustainable garments and thereby promoting circular economy.

Annex D - Method for modelling of impacts & detailed findings

Part 1 Methodological details of the modelling approach

The FRAMES model

The process of estimating economic and jobs impacts of circular economy activities in Egypt 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 Egypt.

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 D1 summarises the data sources used to construct FRAMES.

Table D-1 Scenario design

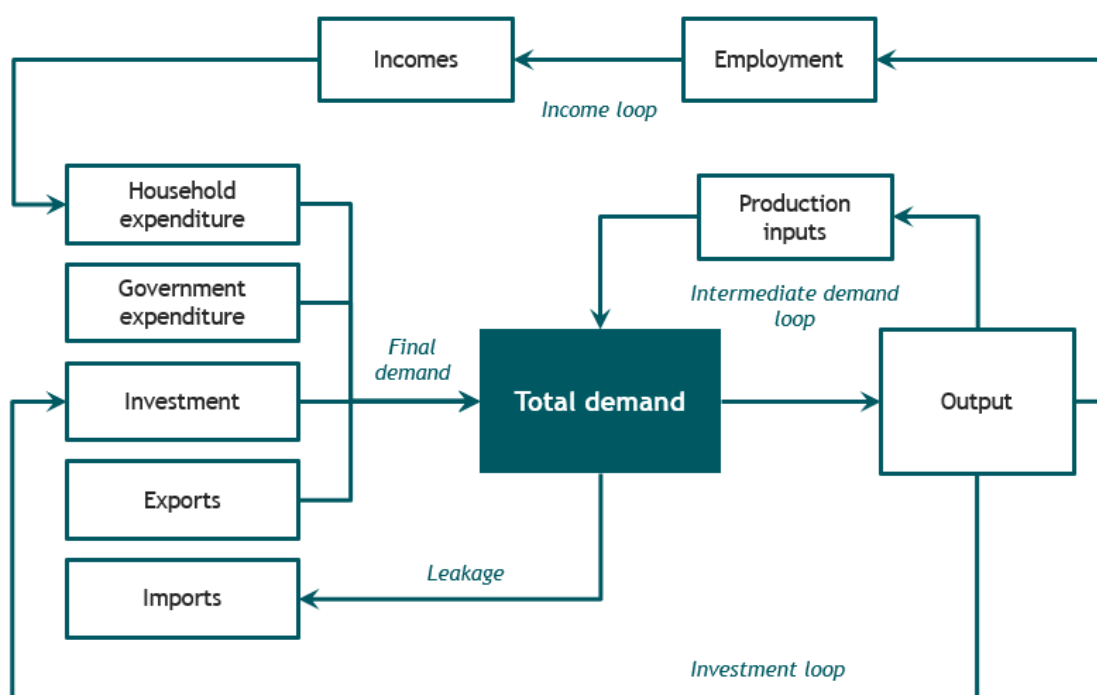
Data	Variables	Source(s)
National accounts	<ul style="list-style-type: none">• GDP• GVA• Consumption• Investment• Trade• Gross output	<ul style="list-style-type: none">• World Bank - World Development Indicators• Eora National IO Tables - Egypt (2015)
Employment	<ul style="list-style-type: none">• Employment• Compensation of employees	<ul style="list-style-type: none">• International Labour Organisation• Eora National IO Tables - Egypt (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 - Egypt (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 Egyptian 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
2. Fishing
3. Mining and Quarrying
4. Food & Beverages
5. Textiles and Wearing Apparel
6. Wood and Paper
7. Petroleum, Chemical and Non-Metallic Mineral Products
8. Metal Products
9. Electrical and Machinery
10. Transport Equipment
11. Other Manufacturing
12. Recycling
13. Electricity, Gas and Water
14. Construction
15. Maintenance and Repair
16. Wholesale Trade
17. Retail Trade
18. Hotels and Restaurants
19. Transport
20. Post and Telecommunications
21. Financial Intermediation and Business Activities
22. Public Administration
23. Education, Health and Other Services
24. Private Households
25. Others
26. Re-export & Re-import

Figure D1 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.

Figure D-1 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).¹⁸⁸

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

¹⁸⁸ For smallholder farmers, there is of course little distinction between wages and profits anyway.

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 D2.

Table D-2 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.

Scenario assumptions

Table D-3 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-3 Scenario assumptions

Category	Circular economy activity	Modelling input	Input size
Waste management	Improved waste collection rate	Increase in waste sector output	Increase from 60% to 95%
E-waste	Improved enforcement of e-waste trade restrictions	Reduction in e-waste (i.e. electronics) imports	n/a
	Improved recycling of valuable materials in e-waste	Investment in recycling sector to improve health & safety standards	€6m
		Share of recycling investment paid for by private and public sectors	50:50
		Exports of materials recovered from e-waste recycling	€15m
Agriculture	Prevention of food loss in agricultural supply chain through improved storage and logistics	Substitution of agricultural imports by domestic agricultural production	€1.15bn
		Investment in storage and logistical capabilities	€335m
		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 D3 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 is 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 D4 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-4 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

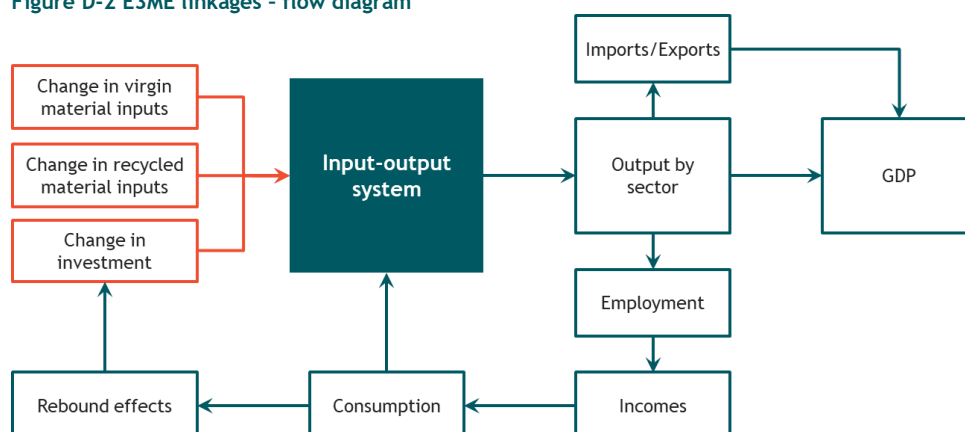
Construction	Construction	IO coefficients
Agriculture	Agriculture	IO coefficients, Investment
Metals	Metal Products	IO coefficients (electronics input)
Chemicals	Petroleum, Chemical and Non-Metallic Mineral Products	IO coefficients (plastic feedstock, mineral fertilisers)
Mining of non-metallic minerals	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 D2 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-2 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 (see Figure 4). 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-5 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	7702.1	7740.9	38.81	0.50%
2. Fishing	483.1	483.7	0.60	0.12%
3. Mining and Quarrying	49.6	49.6	0.01	0.02%
4. Food & Beverages	475.9	475.9	0.00	0.00%
5. Textiles and Wearing Apparel	204.3	204.6	0.25	0.12%
6. Wood and Paper	424.4	424.4	0.00	0.00%
7. Petroleum, Chemical and Non-Metallic Mineral Products	802.1	801.5	-0.53	-0.07%
8. Metal Products	444.5	444.6	0.06	0.01%
9. Electrical and Machinery	1181.5	1183.6	2.11	0.18%
10. Transport Equipment	380.1	380.5	0.39	0.10%
11. Other Manufacturing	195.3	195.3	0.00	0.00%
12. Recycling	7.8	8.1	0.25	3.26%
13. Electricity, Gas and Water	496.8	496.8	0.09	0.02%
14. Construction	4468.1	4485.3	17.20	0.38%
15. Maintenance and Repair	100.6	100.6	0.00	0.00%
16. Wholesale Trade	2137.6	2137.6	0.00	0.00%
17. Retail Trade	2057.3	2057.3	0.00	0.00%
18. Hotels and Restaurants	910.8	910.8	0.00	0.00%
19. Transport	1333.2	1334.8	1.54	0.12%
20. Post and Telecommunications	1544.9	1557.3	12.38	0.80%
21. Financial Intermediation and Business Activities	1054.8	1060.6	5.78	0.55%

22. Public Administration	2067.9	2067.9	0.00	0.00%
23. Education, Health and Other Services	3697.4	3719.3	21.95	0.59%
24. Private Households	850.1	850.1	0.00	0.00%
25. Others	547.0	547.0	0.00	0.00%
TOTAL	33617.1	33718.0	100.87	0.30%

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