



Ministry of Foreign Affairs

Waste Management in the LATAM Region

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Waste Management in the LATAM Region

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Business Opportunities for the Netherlands in
Waste/Circular Economy sector in eight countries
of Latin America



Netherlands Enterprise Agency



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Executed by:

Holland Circular Hotspot

In collaboration with:

Herman Huisman (A4waste)

Bert Keesman (MetaSus)

Linda Breukers (Holland House Waste Window)

Commissioned by:

The Netherlands Enterprise Agency (RVO) and

the Regional Business Development LATAM

team (RBD-LATAM)

Supported by:

Embassies of the Kingdom of the Netherlands



Research Team



Freek van Eijk – Director of Holland Circular Hotspot – expert in the field of waste management and circular economy. He served, for over a decade as director of Strategy and PA at multinational SUEZ and as a board member at the Dutch Waste Management Association.



Herman Huisman (A4waste) – Expert in waste management, policy development and economic diplomacy. He was a director of the Netherlands Waste Management Council and worked for the Netherlands Enterprise Agency (RVO) on development of international projects on waste management. Currently he is involved in projects on plastics, biomass, food and general waste.



Bert Keesman (MetaSus) – Expert in sustainable waste management. He has many years of experience in the implementation of cleaner production and CSR. Through MetaSus, he promotes exports and international cooperation in environmental technology: products and services related to waste management, circular economy, wastewater treatment, air quality, soil remediation, renewable energy and energy efficiency.



Linda Breukers (Holland House Waste Window) – Develops and implements projects on solid waste management and CE throughout Latin American, particularly focused on Dutch-Colombian collaboration. She has worked for the Ministry of Environment and Sustainable Development of Colombia, as the packaging expert of the CE team and currently involved in several projects for the World Bank.

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Acknowledgement

With this report, HCH hopes to bring the waste management opportunities in eight LATAM countries to the attention of many Dutch entrepreneurs and innovators. We hope that their expertise and approaches will give a boost to waste management activities and lay the foundation for the transition to a circular economy in the LATAM region.

We would like to express our deepest gratitude to the many local waste management experts from governmental and private sectors who have provided us with valuable information in the many interviews we have collectively conducted.



You are welcome to join the LinkedIn Group at: <https://www.linkedin.com/groups/12472101/>.

Chapter 1: Introduction

In this document, we present the findings of our study on business opportunities in waste management and circular economy in the LATAM region. The study was carried out at the request of the Netherlands Enterprise Agency and the Dutch Regional Business Development cluster in this region.

The study identifies the state of the market and regulatory framework in eight countries: Mexico, Panama, Argentina, Colombia, Costa Rica, Peru, Chile and Ecuador, and matches the needs/demands in the market for waste management with the unique selling points of Dutch businesses.

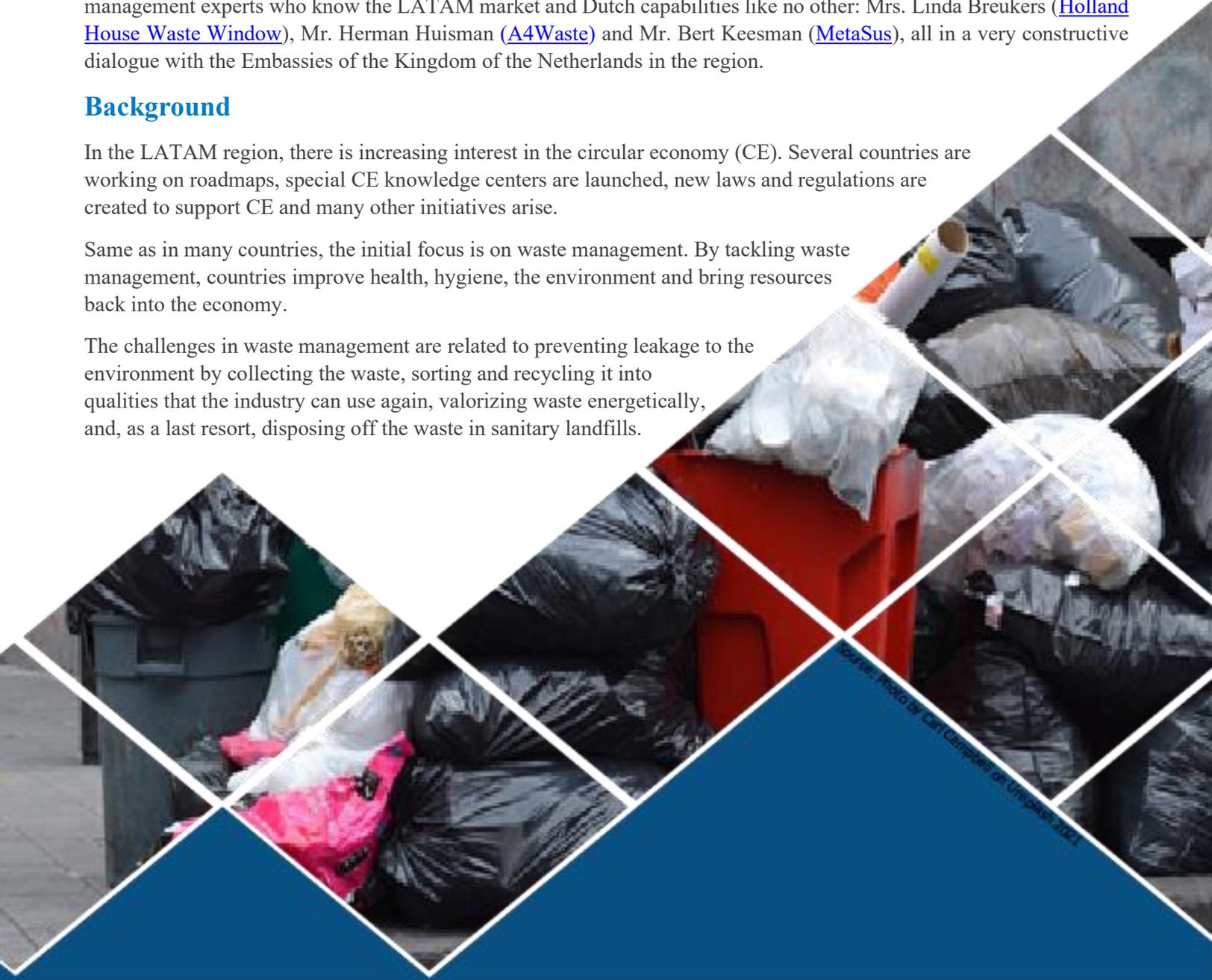
This study has been executed by [Holland Circular Hotspot](#) (HCH) in close collaboration with leading regional waste management experts who know the LATAM market and Dutch capabilities like no other: Mrs. Linda Breukers ([Holland House Waste Window](#)), Mr. Herman Huisman ([A4Waste](#)) and Mr. Bert Keesman ([MetaSus](#)), all in a very constructive dialogue with the Embassies of the Kingdom of the Netherlands in the region.

Background

In the LATAM region, there is increasing interest in the circular economy (CE). Several countries are working on roadmaps, special CE knowledge centers are launched, new laws and regulations are created to support CE and many other initiatives arise.

Same as in many countries, the initial focus is on waste management. By tackling waste management, countries improve health, hygiene, the environment and bring resources back into the economy.

The challenges in waste management are related to preventing leakage to the environment by collecting the waste, sorting and recycling it into qualities that the industry can use again, valorizing waste energetically, and, as a last resort, disposing off the waste in sanitary landfills.



Waste management has a value-chain deficit. Regulation and enforcement and sometimes economical steering methods like landfill tax or extended producer responsibility will be needed to steer the waste in the direction of preferential treatment. Moreover, demanding a minimum percentage of recycled material in new products is needed, if the market does not take up these secondary materials by itself for reasons of price. By proper waste management, the overall net cost to society can be reduced.

Structure

In this document, we have included eight focused 5-pager-reports for each country in scope of the study. The country reports include: facts and figures, an overview of the policy landscape and a focus on the main identified key opportunity areas. The waste flows included in the evaluation are amongst others: Municipal Solid Waste, Commercial & Industrial Waste, Construction & Demolition Waste, Organics, Plastics and Waste from Electric and Electronic Equipment (WEEE). For LATAM readers we have included an overview of “waste management in the Netherlands” with references to key capabilities and unique selling points of selected Dutch suppliers¹

In order to allow Dutch technology providers and waste management experts to assess the LATAM market and to zoom in on countries that match their offerings, the project team, under the guidance of Mr. Keesman, has developed an innovative new instrument: a **Waste Management Maturity Matrix**. This allows for comparison and includes an overview of scores according to general as well as waste-specific indicators as well as graphs. There are numerous challenges and opportunities in each of the countries. We conclude by highlighting the opportunities where the Dutch have most to offer, recognizing that by doing so many individual opportunities remain unmentioned.

For Dutch entrepreneurs new to the region, we have included a general paragraph on how to do business in the LATAM region from a cultural and social perspective. We know that each country is quite unique and special, but we wanted to give some sort of guidance for beginners.

Chapter 2: Country Reports

Waste Management Country Reports

This paper aims to provide a better understanding of business opportunities for the Dutch waste/CE sector in the LATAM region.



Source: Photo by CCANAL 2011



ARGENTINA

Country Information

Argentina is famous for its amazing landscapes, from cactus-filled deserts and lofty Andean peaks to deep-blue lakes and verdant forests. Add to that the wonders of the Iguazú Falls and Patagonia. It is the world’s eighth largest country, well known to the Dutch as the birthplace of Queen Máxima.

Argentina is a federation of 23 provinces plus the autonomous city of Buenos Aires (CABA). Together with the surrounding municipalities, the city constitutes the Metropolitan area of Buenos Aires (AMBA). This metropolitan area has a population of 15.8 million, which occupied only 0.4% of the surface of the Argentine Republic and generated almost half of the GDP (48%)^x.

The country is endowed with fertile lands, gas and lithium reserves and has great potential for renewable energy. It is a leading food producer with large-scale agricultural and livestock industries.

The historical volatility of economic growth and the accumulation of institutional obstacles have negatively affected the country’s development. A turning point in economic policies came in 2020 as a result of the change in government and the COVID-19 outbreak. As a response, Argentina has implemented fiscal, monetary and exchange rate policies designed to support the social and productive sectors. As Winston Churchill put it: “Never let a good crisis go to waste”. The aftermath of the COVID-19 pandemic may provide a unique opportunity for a green recovery and a just transition to a circular economy in Argentina.

1. The Waste/CE Market Analysis

1.1 Facts & Figures Waste Generation and Composition

According to the Ministry of Health and Environment, in 2018 Argentina produced almost 14 million tons of Municipal Solid Waste (MSW), or around 0.86 kilograms per person per day. Some 10% was recycled, the remainder was landfilled or improperly disposed of in dumpsites. 50% of the Municipal Solid Waste was organic waste. Fishing industries contributed their fair share of organic waste with 140 kilotons in 2018. 19.7% of Municipal Solid Waste consisted of recyclable materials such as glass, carton and plastics.

Key Indicators	
Size	Argentina is 67 times larger than the Netherlands
Population (2019)	45 million ⁱⁱ
Nominal GDP (2019)	USD 444.46 Billions world rank: 29 ^{thiii}
GDP per capita (2019)	USD 23,040 ^{iv}
Import from the NL (2018)	USD 27 million ^v
Economic growth (2018)	-2.5% ^{vi}
Ease of doing business rank (2019)	126/180 ^{vii}
Corruption index (2019)	66/198 ^{viii}
Unemployment rate (2019)	9.8% ^{ix}
Currency	Argentinean Peso (ARS)
Time difference NL	-5/-4 hours

There is no data available on the generation of Construction and Demolition (C&D) Waste. In 2018, the total amount of Hazardous Waste was almost 152 kilotons^{xi}. Furthermore, Argentina produced 400 kilotons of Electrical and Electronic Equipment Waste (WEEE) per year^{xii}.

Some waste management data can be found at the national level at the Ministry of Environment and Sustainable Development (MAyDS) and at the metropolitan level in the [Ecological Coordination Society of the State Metropolitan Area \(CEAMSE\)](#). In general, reliable data on the Argentinian waste sector is

hard to find. This can be a promising field to bring in Dutch products and expertise.

1.2 Collection and Disposal

1.2.1 Waste Collection

In Argentina, the population is highly concentrated in urban areas (90%). This is why in this report we mainly concentrate on urban waste, with some comments on opportunities in rural waste as well. The concentration in urban areas has a positive impact on the collection coverage which is 99.8%^{xiii}. 46% of the collection is carried out by the municipalities, the other 54% is done through subcontracting. CEAMSE is the main waste treatment company in the country and also the operator of landfills. Among other tasks, this organization is responsible for waste management in the Metropolitan Area of Buenos Aires (collection, transport, transfer, treatment and final disposal). In Buenos Aires, big international waste collection companies are also active: Benito Roggio (Cliba), Aesa (Veolia) and Urbasur (Urbaser).

1.2.2 Waste Disposal

According to the Ministry of Environment and Sustainable Development of Argentina, the waste of almost 65% of the population ends up in sanitary landfills. Such landfills are mainly concentrated around the bigger population centers. In regions such as Mesopotamia in the northeast only 15% of Municipal Solid Waste ends up in sanitary landfills. The remainder goes to waste dumps or is dumped illegally, buried etc. Altogether there are some 5,000 waste dumps in the country.

The biggest landfill in South America is located in Buenos Aires. The so called [Complejo Ambiental Norte III](#) is operated by CEAMSE and receives 14,000 tons of garbage a day (about twice the amount of Doña Juana in Bogotá). Assuming the average garbage truck carries a load of 20 tons (in reality it is less), it means that 700 garbage trucks are needed on a daily basis to deliver Buenos Aires's garbage to the landfill. The associated logistics probably do not go unnoticed by the surrounding community. In the city of Buenos Aires, there is no space to create new landfill sites. This creates pressure on the overall system to minimize the generation of waste and divert as much as possible from landfill. Dutch companies can step in with waste

prevention strategies, recycling, (possibly) waste to energy, etc.

1.3 Value Chain

1.3.1 Recycling

Traditionally, waste collection for recycling in Argentina has been dominated by the informal sector (also referred to as the “cartoneros”). In the city of Buenos Aires alone, the number of waste pickers is 25,000 and the number of people dependent on these activities is nearly 100,000. Same as in other Latin American countries, there are initiatives to integrate the waste pickers in a more formal system of recycling, but not all waste pickers are interested to join in. At this stage, approximately one third has a formal contract and sells the recyclables to cooperatives of waste pickers. Many of the others sell to private companies and/or on the black-market. It is estimated that 15 cooperatives recover 15% of the solid waste generated in Buenos Aires.

In 2017, the total recycling of plastics in Argentina (domestic, industrial, commercial, agricultural) amounted to 228,000 tons. The recovery industry is as yet underdeveloped, and it is concentrated in metropolitan areas. In Buenos Aires, there are several so-called green points (puntos verdes) installed around the city, where citizens can hand in their recyclables. Unfortunately, the country has not implemented systems of Extended Producer Responsibility (EPR) yet. In this area, Dutch public and private entities could be a major help with a final goal of increasing recycling rates significantly.

1.3.2 Composting

50% of Municipal Waste in Argentina is organic in nature. There are a number of plants for the biological transformation of waste through aerobic composting in different locations. Unfortunately, the project team has not been able to unearth information on the capacities of the plants nor on their performance. In most plants, composting is carried out with minimal equipment and their lifespan tends to be limited. The composting plant with the highest capacity is the one operated by the private company Tecsan Ingenieria Ambiental S.A., in the Norte III Complex in Buenos Aires. It has a capacity of 800 to 1,100 tons per month. In 2010, the compost produced was registered with SENASA (National

Service for Agri-food Health and Quality) to be used as a soil improver.

In the Netherlands, separate processing of organic waste from households is mandatory. As a result, and on the basis of experiences in mushroom cultivation, Dutch companies have a long track record in composting techniques. In parallel with technological innovations, it will be important to work on the introduction of composting standards which will help to create a market for the compost.

1.3.3 Waste to Energy

At first glance, the size of the metropolitan area of Buenos Aires and its waste output (15 million people and almost 18,000 tons a day) appear to justify research into the possibility of mass burn incineration plants. Indeed, in September 2019 the Italian company P&W Engineering and Consulting reported that in the period 2016-2017 it carried out studies into the feasibility and preliminary design of one combined MBT and Waste to Energy plant at Buenos Aires Villa 31 (capacity 18,000 tons per year) and another Waste to Energy plant in Buenos Aires Villa Soldati (capacity 930,000 tons per year). However, to date, there is no such plant in Argentina (and not even in South America, for that matter). It would be interesting to know the results of the P&W studies and possibly follow up with an update of the figures. As a result of the application of the Zero Waste Law in the city of Buenos Aires, today landfill gas capture is used to produce electricity in one out of the four existing landfill sites in the province of Buenos Aires. The main source of dry biomass in the country is agriculture (raw agricultural commodity and rice straw). According to a recent study by the National Industrial Technology Institute (INTI), it is estimated that there are 80 biodigesters of different sizes in the country. As an example, the private company Pacuca SA is building three biodigesters that will generate electricity from animal waste.

2. Governance on Waste/CE

2.1 Waste Management

The environmental governance structure in Argentina is based on the distribution of powers among the federal, provincial and municipal governments which was defined in the 1994 constitutional reform. The federal Secretariat of Environment and Sustainable

Development (SAyDS) coordinates environmental management functions with the provinces and municipalities. The municipalities are in charge of the management of Municipal Solid Waste (MSW) in their jurisdiction. This means they are responsible for collecting and disposing of the waste, for setting the rules and levying the waste fees. They also take care of the operation and maintenance of the waste management infrastructure. At the provincial level, this is supported by a series of environmental organizations (ministries, secretariats or agencies) that promote waste prevention and environmental protection in waste management.

At the national level, Argentina has a General Environmental Law (Law 25,675) and a Management of Industrial and Services Waste Law (25,612). In addition, there is the Law on the Management of Domestic Waste (Law 25,916). In 2004, the Argentinean government developed a National Strategy for Integrated MSW Management, ENGIRSU, for the period 2005 to 2025. The main objective of this strategy is to minimize the generation of solid waste and maximize its valorization. This pushed the city of Buenos Aires in 2005 to implement principles from Greenpeace Argentina, as part of the *Ciudad Verde Plan* (Green City Plan), through the so called Zero Waste Law. The principal aim was to reduce the amount of waste ending up in landfills by 75% in 2017. When this was not achieved, the goal was changed into an 80% reduction in 2030. Initially, the law also prohibited waste incineration, but this provision was taken out in 2018.

Argentina has not yet implemented Extended Producer Responsibility (EPR) policies. Furthermore, efficient information management systems and additional economic instruments for sustainable waste management will be required. In Argentina, there are no specific national regulations for Electric and Electronic Waste (WEEE), but certain provinces have taken the initiative to regulate this. In some provinces electric and electronic waste is considered hazardous waste, in others it is not, complicating the management of WEEE at the national level. In 2011 Buenos Aires adopted Law No. 14,321 on the Sustainable Management of Electrical and Electronic Waste. However, this law is still in the process of implementation, due to the low priority given, and the lack of public awareness of the impact of waste (WEEE) on the environment.

2..2 Policy Landscape: Circular Economy

In 2016, Argentina launched its bioeconomy strategy document^{xiv} and in 2018, the Argentinian government co-signed a letter of intent with the Inter-American Institute for Cooperation on Agriculture, which paved the way for the country to become a regional bioeconomy knowledge hub. In 2019, the private sector took the initiative to strive towards the circular economy. The Association for the Study of Solid Waste (ARS), which is a cooperative effort between Argentinian companies and institutions with a desire to manage their waste sustainably, has developed the National Strategy for the Circular Economy. The aim is to pressure the government to improve the regulatory framework to support businesses in transitioning towards circularity^{xv}.

3. Financial Aspects

The waste sector in Argentina remains underfinanced. The situation is slowly improving, however. Waste pickers are gradually getting acknowledged for their efforts. Currently, municipalities are spending between 15% and 20% of their budgets on waste treatment. These resources come from national or provincial property taxes. Awareness is growing on the need for Extended Producer Responsibility (EPR) schemes, which could pump additional funds into the overall system. In Argentina, circular economy projects which have been funded by the World Bank (WB) and the Latin American Development Bank (CAF) tend to focus on waste management programs. In 2020, the World Bank provided two guarantees to support the Fund for the Development of Renewable Energies (FODER). At the end of 2019, the high level of public debt (equivalent to 89.4% of GDP), it was reported that the persistent balance-of-payments deficit and the lack of access to global capital markets remain obstacles to acquiring international loans for sustainable development and circular economy projects.

4. Stakeholders

In many municipalities, the collection and transport of MSW is mostly carried out by the local government. Hazardous waste and Industrial waste are managed by the private sector. The biggest waste companies in Argentina are [Benito Roggio](#) and Veolia. In addition, Veolia has the biggest market share in collection and

processing of hazardous waste. In Argentina, the main associations in the sector are:

- [CEADS](#)
- [FACyR](#)
- [ARS](#)
- [CAIP](#)
- [AFCP](#)

5. Dutch–Argentinean Cooperation

Being the third investor in Argentina (after the United States and Spain) and Europe’s primary importer of Argentinian goods, the Netherlands plays an important role as international trade partner. This was evidenced by Argentina’s invitation to the Netherlands as guest country during its G20 Presidency in 2018. In March 2017, a number of agreements between Argentina and the Netherlands were signed on agro-logistics, water (governance, sanitation, wastewater treatment, etc.) and port cooperation. This offers a good opportunity for the inclusion of Dutch companies in future Argentinean developments in those sectors.

6. Business Opportunities

In Argentina, business opportunities are abundant in the waste/CE sector. Let’s single out some prominent ones.

6.1 Processing of Organic Waste from Municipal, Industrial and Agricultural Sources

Overall, Argentina lacks knowledge on the production and application of high-quality compost and biogas. This creates many opportunities for Dutch actors to provide knowledge, technology and infrastructure solutions for compost and biogas production. In a country such as Argentina where agriculture is so prominent, there are opportunities in the joint development of circular agriculture systems in which agricultural residues are put to good use as valuable resources. This is an area where the Netherlands is increasingly developing innovative solutions and therefore a promising field of cooperation.

As part of the circular economy strategy and through its so called “RenovAr” Programme, the Argentinean government has promoted the use of biogas. In the period 2015-2020, 80 to 100 biogas projects have been developed. Currently, four provinces lead the generation

of biogas: Buenos Aires, Córdoba, Entre Ríos and Santa Fe. The field is still largely open in the other 19 provinces. Since in Argentina very basic technologies for manure treatment are applied, there are opportunities for Dutch companies with equipment to produce biogas or compost out of animal manure and food residues^{xvi}. Regarding the extraction of gas from landfills, the Netherlands has extensive expertise and has developed innovative techniques for more efficient gas extraction.

Another meaningful market-driven opportunity in Argentina lies in the field of new packaging from the plastic waste generated by the agricultural sector and processing techniques as well as control systems for laboratories.

An interesting example of this is the plastics recycling plant of the Argentinean Association of Cooperatives (ACA) in Cañada de Gómez in Santa Fé Province. In this plant, discarded containers and silo bags from the associated cooperatives are processed into new containers and bags for own use and plastic pellets for sale to some 40 industries. In three years of operation, 9,000 tons of plastics were recuperated, which is about half of the volume used in the cooperatives. In purely economic terms, the plant is not yet profitable, but a lot of virgin polyethylene is saved. High end Austrian/German machinery was applied in this case.

6.2 Recycling Technologies, for EPR Packaging, Tires and Waste Electrical and Electronic Equipment (WEEE)

The Dutch value-chain approach with actions from public entities (EPR, green procurement, consumer communication) and private players can be inspirational for Argentina and can help create various markets in a.o. the plastic sector. EPR-systems for tires, WEEE and packaging waste should be implemented (same as in Colombia and Chile) to comply with more ambitious recycling targets.

Equipment suppliers in the Netherlands can offer a broad portfolio of waste separation and recycling plants, both for source separation and single stream recycling systems. These plants can process C&D waste, commercial and Industrial waste, bulky household waste and plastic packaging waste. This can help to professionalize the waste processing sector in Argentina. As a side benefit, there are circular and regulatory

consultancy opportunities. In the circular economy arena, there is scope for collaboration in new business models that keep materials in the loop.

6.3 Processing of Construction and Demolition (C&D) Waste

To date, only the metropolitan area of Buenos Aires has a formal recycling plant for C&D waste. Mid-sized cities will also need local and regional collection and recycling solutions. This will require a rethinking of the business model in the C&D sector. Argentina can benefit from the developments on the Dutch market in the use of secondary materials.

Besides, the construction sector offers opportunities for Dutch companies active in the first phase of the building life cycle. Argentina lacks knowledge on how to close the loop on building materials, starting at the design phase (eco-design). Architects and suppliers of sustainable construction materials can fill this void.

7. Concluding Remarks

Argentina is a fascinating member of the Latin American family of countries. "Never a dull moment", is a way to describe the Argentinean economy. The effects of the April 2018 monetary crisis still persist today, and the COVID-19 situation has not made things any easier. At the same time, Argentina ranks high in technological development in the region, with software development and data science being in the forefront.

In this context, the Argentinean waste and circular economy sector is developing slowly but surely. Dutch suppliers of equipment, services and expertise in waste/CE are advised to make a thorough assessment of available local technologies and approaches, then team up with local players to deliver additional products and services or to develop joint ventures or projects. As indicated in this profile, opportunities abound in the waste and circular economy sector. In addition, Argentina's vast agricultural sector offers a wealth of opportunities to work towards circular agriculture.



CHILE

Country Information

Chile is known as one of the best producers of premium wine. In 2010, the country became the first member, in South America, of the Organization for Economic Co-operation and Development (OECD). Chile is also known for its stable and responsible macroeconomic and fiscal policies. The country is considered an attractive starting point to later on expand to the rest of the countries of Latin America.

Chile has set ambitious goals towards a sustainable and circular transition. The main strategies are: [the Energy Roadmap](#), [the Roadmap for Circular Economy](#), [the Plastic Pact](#) and the “[Extended Producer Responsibility \(EPR\)](#)”. In addition, Chile’s current policy pathway includes a Renewable Energy Law and a Carbon Tax. The country has experienced social unrest since October 2019, followed by the COVID-19 pandemic since early 2020. As a response, the Chilean government has used the momentum to plead for green recovery and has even intensified its climate ambitions. For example, early 2020 Chile has adjusted its legislation by [updating its National Determined Contribution \(NDC\)](#) committing to reduce net GHG emissions up to 45% by 2030, compared to 2016 levels.

Key Indicators	
Size	The Netherlands is 5.49% the size of Chile
Population (2019)	19.1 million ^{xvii}
Nominal GDP (2019)	USD 282.2 Billion world rank: 43 rd ^{xviii}
GDP per capita (2019)	USD 25,155 ^{xix}
Import from the NL (2018)	USD 83 million ^{xx}
Economic growth (2018)	4% ^{xxi}
Ease of doing business rank (2019)	59/190 ^{xxii}
Corruption index (2019)	26/180 ^{xxiii}
Unemployment rate (2019)	7.2% ^{xxiv}
Currency	Chilean Peso (CLP)
Time difference NL	-4/-5/-6 hours

1. The Waste/CE Market Analysis

1.1 Facts & Figures. Waste Generation and Composition

Chile generated about 23 million tons of waste in 2017^{xxv}. 97% of this amount was non-hazardous in nature. Non-hazardous waste mostly originates from industrial sources (60%) and from municipalities^{xxvi} (35%). Sludge from sewage treatment plants contributes 1%. Almost half (49%) of the waste is generated in the Santiago Metropolitan Region, making this area a prime geographical focus of ameliorating actions in the waste sector. When it comes to the composition of the waste, 58% of Municipal Solid Waste (MSW) corresponds to organic waste. Less than 1% of this amount is valorized through composting or otherwise^{xxvii}. Only 12% of plastic packaging and 5% of tires is recovered at the end of their life cycle^{xxviii}. Regarding waste coming from industrial sources, the agricultural sector generates 1.6

million tons per year and C&D waste amounts to 230,000 tons per year^{xxix}.

The country has three waste data systems; [the Declaration and Monitoring of Hazardous Waste \(SIDREP\)](#), [the National System for the Declaration of Waste \(SINADER\)](#) and [The National System of Environmental Enforcement Information \(SNIFA\)](#).

1.2 Collection and Disposal

1.2.1 Waste Collection

The municipalities are responsible for collecting, transporting and disposing of waste. Waste collection rates are higher for urban areas (e.g., Santiago de Chile 97%)^{xxx} than for rural areas (30%). All in all, 96% of the Chilean population is serviced with waste collection. Many Chileans live in tall vertical buildings which are the ideal location for testing large domestic collective systems (referred to as GRANSIC). For example, the municipality of Providencia has created the first pilot

plan covering 58,000 apartments to test how a massive collection system for recycling operates^{xxxii}.

Waste collection and transportation are as yet highly inefficient and expensive. These services are executed by 15 companies all around Chile. Two groups: Dimensión and Starco-Demarco cover 46% of the market. The average cost of the collection and transportation service is around CLP \$ 22,000 (USD 35) per ton^{xxxiii}. Waste is collected door-to-door in plastic bags by trucks. The informal sector is highly active with at least 60,000 operating waste pickers.

1.2.1 Waste Disposal

In Chile, more than 70% of Municipal Solid Waste is disposed of in authorized facilities. This means that around 16 million tons of waste generated each year ends up in sanitary landfills. The Ministry of Environment (MMA) estimates that only 2% of Municipal Solid Waste is recycled. The reason is that for the municipalities it is more expensive to recycle than to take it all to the landfill. Regarding final disposal, the average cost of the service is CLP \$ 10,918 per ton (around USD 17 per ton)^{xxxiii}. Four sanitary landfills operate in the Santiago Metropolitan Region that receive MSW. According to SUBDERE^{xxxiv} in 2019, there were 79 illegal dumpsites^{xxxv} in the Metropolitan Region, and 600 micro dumpsites. In this regard, Dutch companies have extensive expertise on the extension of the useful life of existing landfills and the development of new sustainable landfills.

1.3 Value Chain

1.3.1 Recycling

Each year in Chile, approximately 990,000 tons of plastic are consumed, of which 84,000 tons (8%) are recycled. About 17% of total recycled plastic waste originates from MSW^{xxxvi}. There are 7,277 drop-off points for recyclables in Chile but to date only one of these has a sorting plant. 64% of the plastic recycling plants are located in the Santiago Metropolitan Region. Capacity utilization for grinding and crushing is only 48% and for pelletizing it is only 57%, so it is worthwhile to increase collection.

Proper waste management geared towards recycling will require a change of habits in Chilean culture. Education is key to generate civil involvement in recycling

activities. The implementation of Extended Producer Responsibility (EPR) systems will create a new market and new commitments with consumers. The regulation, to be financed by producers and importers, will typically mean that both collection and recycling targets will have to be met.

It is estimated that Construction and Demolition (C&D) waste represents approximately 34% of solid waste generated^{xxxvii}. However, there is no consensus figure regarding the exact amount of C&D waste. It is difficult to assess, if only because 9 out of the 16 regions in the country do not have places for authorized disposal of C&D waste. In 2017, only 8.4% of this waste was valorized.

1.3.2 Composting

In line with other countries without separation at source, 58% of the MSW in Chile is organic waste. In addition to this, 1.6 million tons/year of industrial waste comes from the agricultural sector. More than 50% of the material disposed of in Chilean landfills is organic waste. There is only a small number of industrial composting plants concentrated in the central area of the country^{xxxviii}. Consequently, municipalities outside the central area prefer to take their organic waste to a landfill in their proximity due to cheaper transportation.

Around 13% of the country's municipalities are implementing actions to recover their organic waste. In this regard, organic residues of agro-food conglomerates offer opportunities as well for composting and anaerobic digestion or even for further valorization. The Dutch Waste Transformers (WT) plants, which are small scale modular anaerobic digesters, can be a potentially profitable option for small scale clients (like shopping malls).

1.3.3 Waste to Energy

Chile has 27 power generation plants based on biomass. In most plants, forestry waste is incinerated to produce thermal and electrical energy, in others organic waste is digested to produce biogas. Most of these plants are strategically concentrated in the so called "Biobio" region which, as the name suggests, has a lot of forest activity.

Three biomass energy generation plants operate in the Santiago Metropolitan Region, with a collective

installed capacity of over 40 MW: (1) Loma los Colorados sanitary landfill 20.2 MW (KDM Energ a S.A.), (2) Santa Marta Sanitary landfill 19.7 MW (Consorcio Santa Marta S.A.) and (3) Lepanto landfill 2.0 MW (Enerkey SpA)^{xxxix}. These three plants depend mainly on residential waste (75%) and also on commercial waste (25%).

Regarding regulatory compliance with emissions, Chile lacks specific regulations for large scale Waste to Energy (WtE) plants. There is a need to create a specific regulatory framework for WtE, aligned with current environmental policies in Chile. Furthermore, linkages should be established between the private sector and the financial sector for the development of viable business models for the development of WtE projects.

Chile wants to become carbon neutral by 2050^{xl}. In order to achieve this ambitious target, the country has started to close down its coal-fired plants. In the waste sector, the country could develop regional collaborative arrangements in order to create (economy of) scale for waste collection and treatment as well as for WtE projects. Dutch private companies and public institutions can support this process. The sector will offer significant opportunities due to the ambitious plan that by 2050 no more than 10% of household waste is to be sent to sanitary landfills. Imagine that today this figure stands at 96%^{xli}. In this spectrum, waste incineration is likely to be projected in metropolitan areas whereas (anaerobic) digestion can be quite localized.

2. Governance on Waste/CE

2.1 Waste Management

In Chile, the Ministry of the Environment (MMA) is in charge of proposing and formulating regulations and plans regarding waste management. On top of this, it provides technical support to municipalities. The Ministry of Health takes care of health issues regarding waste management and is also in charge of special Waste-streams (non-WSW). The Ministry of Housing and Urbanization defines criteria and infrastructure for the valorization of waste and standards at the national level, whereas the Environmental Assessment Service (SEA) manages project authorizations. In organic waste they cooperate with the Ministry of Agriculture. The Ministry of Health regulates the Commission of Drinking Water and Basic Sanitation (CRA).

The regional and local governments are responsible for the execution of waste management services. For this, the municipalities design a 5-year municipality waste management plan (PGIRS).

2.2 Circular Economy

In 2017, the [National Organic Waste Strategy 2018-2020](#), was approved. The main goal is to grow from the current 1% to no less than 66% of valorization of Municipal Organic Waste by 2040. Unfortunately, this organic waste strategy is not yet supported by any laws, such as the EPR law. It includes goals but no sources of financing.

In 2019, the MMA^{xlii} together with the Ministry of Economy, CORFO^{xliii} and ASCC^{xliiv}, launched the “[Roadmap for Circular Economy](#)^{xliv}”. A number of topics have already been set in motion, such as a proposal for the gradual implementation of a landfill tax for the disposal of industrial waste in sanitary landfills and also one for municipal waste. Another important topic is defining a role for waste-to-energy, which will be one of the keys to achieving the ambitious targets.

Chile has become an OECD member in 2010. In an effort to meet OECD standards, the country has taken the first steps towards implementing an “[Extended Producer Responsibility \(EPR\)](#)” policy. In 2015, Chile adopted this policy that focuses on six key products: lubricating oils, electric/electronic devices (WEEE), batteries, packaging, newspapers and magazines, and tires. In August 2018, Chile prohibited single-use plastic bags given out by businesses throughout the country. In 2020, the [Plastics Pact](#)^{xlvi} was launched. Its main goal is the elimination of unnecessary single-use plastic by making 100% of plastic packaging reusable, recyclable, or compostable.

MMA has also released a Policy for the **Inclusion of Waste Pickers 2016- 2020** and certifying their labor skills. Finally, Chile has adopted a [Construction and demolition waste roadmap 2025/2035](#) that seeks to reduce C&D waste by 70% in 2035. New business opportunities are expected to develop as a result of this. Enforcement of policies will require adequate staffing, implementation of fees and cultural alignment with legislative goals.

3. Financial Aspects

Same as in most countries that have been studied, the waste management and circular economy sector in Chile is underfinanced. However, the country has been accelerating a transition in this respect since 2005 with the modification of **Decree Law No. 3,063 on Municipal Revenue**. In Chile, household waste management services are generally funded through real estate tax contributions. However, nearly 80% of properties are exempted from paying this tax, so the occupants of these properties do not pay for the collection and disposal of their waste. Decoupling property taxes and waste fees, together with the introduction of a municipal waste tax, could improve the financial situation of the waste sector. Under the EPR law the management of packaging and packaging waste will have to be co-financed by private parties, which is a new revenue stream into the sector.

In Chile, the Global Environment Facility ([GEF](#)) has sponsored renewable energy generation based on biomass and the Inter-American Development Bank ([IADB](#)) has provided grants for waste management. The Undersecretariat of Regional and Administrative Development ([Subdere](#)) also provides financial means for waste management investments. Regarding circular economy the Chilean Ministry of the Environment and the national economic development agency [CORFO](#) support circular activities in Chile^{xlvii} with strategic investments and financial incentives^{xlviii}.

4. Stakeholders

The collection and transport of MSW is mostly carried out by the municipalities. However, under the EPR law producers would be responsible for organizing and funding "Management Systems" for the waste of priority products they introduce into Chile.

It is important to mention that in Chile, private sector companies tend to be part of different associations. For example, the members of the Plastic Pact committee (apart from the Ministry of Environment) are Acoplásticos, ADC circular, the National Movement of Waste pickers of Chile and Industrial Association of Plastic Industry (ASIPLA). These associations represent the plastic producers, the Chilean industry, the waste pickers, and the public service companies, respectively.

The main associations in the sector are:

- [AEPA](#)
- [ADC Circular– Association of Sustainable Consumers of Chile](#)
- [Industrial Association of Plastic Industry \(ASIPLA\)](#)
- [The National Movement of Waste Pickers of Chile \(MNRCH AG\)](#)
- [Association of Msur Municipalities](#)
- [Amusa](#)

5. Dutch–Chilean Cooperation

Chile and the Netherlands have an economic collaboration on several topics, the Paris Agreement being one of them. Examples of fields of collaboration are the better use of water resources, “The Integrated Water Resource Management”^{xlix}, and the coastal rehabilitation project called “Building with Nature Solutions”. In addition, there are issues that set the agenda for economic cooperation between both countries such as hydro resources, environment, sustainable cities, circular economy, ports and engineering services^l. Chile and the Netherlands have signed an MOU in the field of water resources management and climate adaptation.

6. Business Opportunities

There are plenty of business opportunities for Dutch companies in the waste and circular economy sector in Chile. Please find below the most important opportunities identified.

6.1 Processing of Organic Waste from Municipal, Industrial and Agricultural Sources

The potential of organic waste is still underutilized and the country lacks knowledge on the production and application of high-quality compost and biogas. Dutch companies can step in and provide technological and infrastructural solutions for compost and anaerobic digestion and biogas production.

Residual organic waste streams can be composted, digested or find circular applications into biobased products or can be used to fuel the move towards renewable energy. Dutch technology suppliers can support Chile in the valorization of organic waste,

starting with industrial waste flows, and produce compost, and renewable energy (biogas). As the vast majority of Municipal Organic Waste is still landfilled, the extraction and use of gas from landfills is an opportunity. The Netherlands has developed efficient techniques for gas extraction, processing and use, some of which are inherently profitable. In addition, Dutch Waste Transformers (WT) plants offer an opportunity for small scale companies to become energy efficient through anaerobic digestion of their organic waste. In the Netherlands there are several companies active in selling their equipment for WT.

6.2 Recycling Technologies, for EPR Packaging, Tires and Waste Electrical and Electronic Equipment (WEEE)

In the coming years in Chile, EPR-systems for tires, WEEE and packaging waste must comply with higher targets. Private companies operating these systems are looking for quality equipment (collection, sorting, upgrading and application in the production process) and collaborative approaches in the value chain, a key expertise of Dutch companies. In the field of packaging, design for reuse, recycling technology and new biobased materials are other opportunity areas.

An opportunity that gets momentum under the new EPR law is Dutch technology solutions for end-of-life tires. The Chilean mining sector has its fair share of (giant) tires. Dutch companies can also help their counterparts in Chile with their know-how (consultancy) on how to smoothly design and operate an EPR system for tires.

6.3 Processing of Construction and Demolition (C&D) Waste

C&D waste is getting increased attention in virtually all countries studied by the project team. Chile has taken this a step further: it has set a target of a 70% reduction of C&D waste by 2035, with a special focus on the fast-growing urbanized areas. Cities are looking for local and regional collection and recycling systems and technology to solve the problems caused by illegal dumping of mixed waste in rivers and other ecosystems.

On top of this, the construction sector offers opportunities for Dutch companies active in the first phase of the building lifecycle. Chile lacks knowledge on how to close the loop of building materials, starting at the design phase (eco-design) and leading up to

standards for recycling and aggregates that can be reused in the built environment. Dutch architects, consultants and suppliers of sustainable construction materials can fill this void.

7. Concluding Remarks

The Chilean waste and circular economy sectors are developing quickly, creating multiple business opportunities, especially with private sector entities. However, Dutch technology costs tend to be relatively high compared to the competition. It is therefore important to stress the life cycle costs and positive external effects such as environmental benefits of products and to look for customers who prefer quality over the lowest initial investment cost.

In Chile, the municipal waste market is a tender driven market that requires a trustworthy local partner with a strong local network. Apart from large private waste producers (agro-food cooperatives, construction firms or mining companies) and EPR organizations, one focus area is on the fast-growing cities with increasing rates of waste generation. The municipal solid waste and industrial waste landfill diversion targets offer opportunities for collection and sorting/recycling of dry recyclables, as well as composting/digestion/high-end valorization of the organic waste, among others. In this regard, the Netherlands has developed advanced collection, logistics and transfer technologies that can help Chile to decisively improve its waste management sector.



COLOMBIA

Country Information

A few years back, the Colombian tourism office launched the slogan: "*Colombia ... the only risk is that you want to stay*". In one go, the country left behind its turbulent past of civil unrest (especially in the countryside) and self-confidently invited visitors to come and enjoy its wonders. By then, businesspeople had already rediscovered the country with its 3% average economic growth over the past two decades. Located in the northwest of South America, Colombia has easy access to both the Pacific and the Atlantic oceans. Half of its territory is covered with forests. Most economic activity is concentrated in the triangle formed by the capital city Bogotá (2,700 mts above sea level, 8 million inhabitants), Medellín (1,500 mts, 2.5 million, world's most innovative city in 2013) and Cali (1,000 mts, 2 million).

The current President, Mr. Iván Duque will be in office until August 2022. The provincial governors and mayors will have until December 2023. In general, the political mood can be considered liberal, creating fertile ground for a dynamic business climate and positively affecting the waste and circular economy sector.

Key Indicators	
Size	Colombia is 27.5 times the size of The Netherlands
Population (2019)	50.3 million ^{li}
Nominal GDP (2019)	USD 323.5 Billion world rank: 40 ^{thlii}
GDP per capita (2019)	USD 15,634 ^{liii}
Import from the NL (2018)	USD 26 million ^{liv}
Economic growth (2018)	2.6% ^{lv}
Ease of doing business rank (2019)	67/190 ^{lvi}
Corruption index (2019)	96/180 ^{lvii}
Unemployment rate (2019)	10.5% ^{lviii}
Currency	Colombian Peso (COP)
Time difference NL	-6/-7 hours

1. The Waste/CE Market Analysis

1.1 Facts & Figures^{lix} Waste Generation and Composition

In 2018, Colombia generated around 14 million tons of Municipal Waste or 0.77 kilograms per person per day. 61.5% was organic waste and 30% recyclable materials (National Planning Department DNP, 2016). 50% of the recyclables came from packaging (Ministry of Environment, 2018). According to DNP and the World Bank, 83% of Municipal Solid Waste ends up in landfills and 17% is recovered, mainly by waste pickers. On top of this, the country generates 25 million tons of construction and demolition (C&D) waste every year (DNP, 2016). The pork and poultry industries together generate 135 million tons of organic waste per year (2015) (Gobierno de la Republica de Colombia, 2019). In 2016, Colombia generated over 300,000 tons of hazardous waste, of which 388 tons were stored, 135.486

tons externally treated, 48,230 tons recovered and 121,112 tons disposed of in special secure landfills^{lx}.

1.2 Collection and Disposal

1.2.1 Waste Collection

The coverage of collection and transport of non-recyclable waste increased from 97.3% in 2015 to 98.6% in municipalities (2017)^{lxi}. Only Bogotá works with five waste companies (one per zone). In the rest of the country, households can decide which waste company will collect their waste. Colombia has 62 official regional landfills, receiving solid waste of 961 (out of the 1,103) municipalities, 96% of the Municipal Waste generated in the country. The rest of the waste is disposed of in (illegal) dumpsites. In 2018, according to the SSPD and DNP, 10.3 million tons of solid waste were disposed of in authorized and unauthorized sites (Superintendency of Residential Public Services SSPD, 2019).

1.2.2 Waste Disposal

The table below shows the landfill situation in Colombia's main cities in 2017 (SSPD and DNP, 2018).

Cities	Landfilled/year [Million Tons]
Bogotá	2.2
Cali, Medellín, Barranquilla	0.7
Cartagena, Bucaramanga, Santa Marta and Pasto	0.2

The average disposal fee in landfills is €8 per ton. At Bogotá's Doña Juana site the fee stands at €13.50 per ton. The major (regional) landfills are operated by the biggest waste companies of Colombia such as Veolia and Interaseo. Landfilling is the cheapest option, so 90% of the waste ends up there. Close to 50% of the landfills will reach capacity within 10 years, so municipalities are eager to look for alternative solutions. Citizens are opposing new landfills in their vicinity. Because of the complicated geo-hydrological conditions in the Netherlands, landfilling and the extraction of gas from landfills continue to be areas of outstanding expertise. Therefore, opportunities for Dutch companies include the extension of the useful life of existing landfills, the introduction of waste diversion techniques such as post collection separation and the development of new sustainable landfills.

1.3 Value Chain

1.3.1 Recycling

Traditionally, recycling activities in Colombia have been dominated by the informal sector (also referred to as the "waste pickers"). The government estimates that there are between 60,000 to 100,000 waste pickers in the country. The Colombian waste industry is aware that recycling rates can only be raised through the introduction of professional collection and processing methods. Therefore, one third of the waste pickers are now participating in a process of professionalization. In 2016, Decree 596 allowed the waste pickers to get paid for their activities (collecting recyclable waste), which is additional income to the selling price of the recyclables themselves.

The Ministry of Housing and the Ministry of Environment have regulated the colors of bags to be used in source separation (black: non-recyclables, white:

recyclables, green: organic waste). This system must be implemented starting 2021. Besides, the national government and the industry are looking for machinery and knowledge to have a more efficient recycling chain. Because of the high transport costs, the companies are mainly looking for regional solutions. For example, in 2019 the biggest PET-bottle recycling company has made a €23.6 million investment in machinery^{lxii}. In Colombia, the recovery rate of C&D waste is a mere 2% (DNP, 2016). Unfortunately, most C&D waste is still dumped as mixed waste at illegal sites (rivers, unused areas) or special dumpsites. Dutch companies have a lot of experience in producing Solid Recovered Fuel (SRF) from mixed wastes. SRF is a promising waste management option that makes optimized use of the calorific value of non-recyclables.

1.3.2 Composting

As mentioned, 61.5% of Municipal Waste in Colombia is organic material. Because of the low tipping fees, it is still cheaper to landfill than to recover this material. As a result, and because of a lack of composting standards, composting is not yet widespread in Colombia. However, in the province of Cundinamarca which surrounds Bogotá, there are 16 composting plants. These plants have found the perfect location for a sustainable business: close to the supply (organic waste) and demand (agriculture). In the Netherlands, in the early nineties, source separation and separate processing of organic waste from households and markets became mandatory. As a result, Dutch companies have a long track record in composting and anaerobic digestion.

1.3.3 Waste to Energy

In Colombia, Waste-to-Energy (W2E) could be a viable option, especially around big cities. However, low tipping fees slow down developments. Interestingly, on the Colombian island of San Andrés (off the coast of Nicaragua, 65,000 inhabitants), a W2E plant was built in 2011. Unfortunately, due to technical and financial difficulties the plant was never put into operation.

Early 2020, the regional government of Medellín, the Ministry of Housing and the company Empresas Públicas de Medellín (EPM) have expressed their interest in building a W2E-plant in Medellín. This may be the best option for a profitable mass burn incineration

plant in Colombia because of the distance to the landfill La Pradera and the involvement of EPM.

The cement industry is using different waste streams (tires, flexible plastics) for their plants and the poultry industry is investigating the recovery of chicken manure. The company Kikes installed the first plant in 2017 (see photo)^{lxiii}. Agriculture residues such as bagasse have long been in use as sources of energy for off-grid solutions.



[Photo: plant of de Caloto, Cauca], (Valle del Cauca.2017), Colombia.

2 Governance on Waste/CE

2.2 Waste Management

The Ministry of Housing is responsible for Municipal Waste policies, sectoral investments (e.g. in landfills) and provides technical support to municipalities. The Ministry of Environment is in charge of special waste streams (non-MSW) and EPR-schemes. They cooperate with the Ministry of Agriculture on organic waste. The Superintendency of Residential Public Services (SSPD) controls the waste entities and the Regulation Commission of Potable Water and Basic Sanitation (CRA) designs and implements the waste tariffs. Both are part of the Ministry of Housing.

The regional and local governments are responsible for the waste management execution. For this, the municipalities must design and implement their 12-year municipality waste management plan (PGIRS). The PGIRS must be updated this year, being the first year in office for the mayors and governors.

The Ministry of Housing recently introduced a landfill tax which initially is set at €1.80 per ton in 2020, to promote recycling. If properly enforced, the 10.3 million tons of waste landfilled annually will fetch €18.5 million

per year. If this works as planned, this situation will create new opportunities for Dutch companies to sell recycling systems.

2.1 Policy Landscape: Circular Economy

The Ministry of Environment and Sustainable Development and the Ministry of Commerce, Industry and Tourism designed the National Circular Economy Strategy^{lxiv} (ENEC), published Nov. 2018. The ENEC promotes strengthening of value chains and contributes to meeting the goals of the Paris Agreement. The National Circular Economy Strategy in Colombia will provide additional momentum to the quest for sustainable waste management. The strategy emphasizes six lines of action represented in six cycles: Industrial materials and consumer products, packaging materials, construction and demolition materials, biomass, water, energy sources and flows. The strategy aims to increase the rate of recycling and waste utilization, which today stands at 8.7%, so that it rises in the year 2030 to 17.9%.

The table below provides some highlights for five out of the six priority lines.

1/ Industrial materials / consumer products
Concrete CE targets for EPR norms
2/ Packaging materials
EPR target: 10% recovery in '21, 30% in '30
3/ Construction and demolition materials
10% recovery rate by 2022 + pilot plants
4/ Biomass
+20% recovery; special tariff organic waste
5/ Energy
+10% installed biomass generation by 2022

In waste, the country is betting heavily on Extended Producer Responsibility systems, on pilot projects and, to some extent, on waste taxes. The above list provides guidance to Dutch exporters of goods and services in waste/CE as to where opportunities will emerge.

In biomass, it is estimated that the Colombian economy annually produces about 178 million tons of residual biomass from agricultural crops (41%), livestock activities (59%), and the residential sector (<1%) (UPME, 2018). Dutch companies specialized in converting this biomass into valuable materials or energy will have significant opportunities.

3 Financial Aspects

The waste and circular economy sector in Colombia is underfinanced. But the situation is improving, with waste pickers being compensated for their efforts, a waste tax in the first phase of implementation (with the proceeds destined for recycling projects), a tax exemption for import of environmental technology and mandatory EPR systems which are expected to pump additional funds into the system. There is a lack of financial instruments to stimulate investments. However, the national government provides additional funds and incentives to support sustainable development projects. The Ministry of Commerce has special entities, such as Innpulsa, Bancoldex and Findeter. In October 2020 Innpulsa started the project “activating the circular economy”. Besides, there are private investment options such as Waste2Worth. The “Investment Guide 2020” of PWC provides a good overview.

4 Stakeholders

In many municipalities, the collection and transport of MSW is mostly carried out by the local government (they acquire the machinery). The other waste streams (hazardous waste, industrial waste and EPR-streams) are managed by the private sector.

The biggest waste companies in Colombia are Interaseo and Veolia. Both are international companies that do collection, transport and landfill management. In addition, Veolia has the highest market share in collection and processing of hazardous waste in Colombia. In Medellín, the public service company EPM and its waste company Emvarias are responsible for waste management. As a result of the free competition in the Colombian waste sector, in the past years some 400 EPR Producer Responsibility Organizations have been created. For tires there are 17, small batteries 30, computers 46 and for packaging waste 25, although the implementation of the norm has not started yet. A thorough review of the value chain is therefore particularly relevant. It is important to mention that in Colombia, all private sector companies tend to be member of one or more associations. For example, the members of the Plastic Pact committee (apart from the Ministry of Environment) are Acoplásticos, ANDI, ANR and Andesco. These associations represent the

plastic producers, the Colombian industry, the waste pickers, and the public service companies, respectively.

The main associations in the sector are:

- [Andesco](#)
- [ANDI](#)
- [Fenalco](#)
- [Acodal](#)
- [Camacol](#)
- [Acoplásticos](#)

5 Dutch–Colombian Cooperation

The Netherlands had a Partners in International Business Program in waste/CE in the period 2014 - 2016, in which the companies VDL Translift, Geesinknorba, WAVIN Overseas, Hofstetter/AWT and Wequips/Bollegraaf participated. Some examples of Dutch waste equipment already in operation in Colombia include several RAVO sweeping machines in Bogotá, Cartagena and Medellín, among other cities. ATN Engineering has installed a recycling unit for fridges. ENKI Engineering has delivered a test installation for the digestion of POME in Santa Marta.

On the 6th of August 2020, the Dutch embassy in Bogotá signed an MoU with the local government of Magdalena (Caribbean coast) focused on circular agriculture^{lxv}. Besides, the embassy is working on an MoU with the Ministry of Environment and the Ministry of Agriculture on circular economy, with special focus on circular agriculture. In addition, where it comes to C&D-waste, the Netherlands will be special invited country for the Camacol^{lxvi} international seminar next year. This will be a huge opportunity for companies working in this sector.

6 Business Opportunities

It is obvious that, in Colombia, business opportunities are abundant in the waste/CE sector. Let us single out some prominent ones.

6.1 Processing of Organic Waste from Municipal, Industrial and Agricultural Sources

Overall, the country lacks knowledge on the production and application of high-quality compost and biogas. Dutch companies can step in and provide technological

and infrastructural solutions for compost and biogas production.

As part of the circular economy strategy, the national government aims to implement two biogas pilot projects before 2022. In Bogotá, city authorities are preparing the construction of a pilot composting plant and the production of biogas at the Doña Juana landfill. The city of Medellín plans to build a biogas plant during this governmental period (2020-2023). This project is in the design phase^{lxvii}.

Since in Colombia only very basic technologies for manure treatment are applied, there are opportunities for Dutch companies with equipment to produce biogas or compost out of pork and chicken manure. Holland House presented these opportunities in the study “*More than Manure: Opportunities for the Dutch technology sector and know-how on manure valorization in the Colombian pig and poultry sector*”, executed for the Dutch Embassy in Bogotá.

It is important to mention that mid-size cities like Pereira and Armenia are looking for small scale solutions to produce electricity from organic waste generated at their marketplaces. Several waste companies and chambers of commerce are on the lookout for international options.

6.2 Recycling Technologies, for EPR Packaging, Tires and Waste Electrical and Electronic Equipment (WEEE)

In the coming years, EPR-systems for tire, WEEE and packaging waste must comply with higher targets. Private companies operating these systems are looking for quality equipment to improve their value chain (collection, separation, and recycling). In the Netherlands, the first EPR-systems were implemented 20 years ago, because of this, Dutch companies can help the Colombia-schemes with their knowledge (consultancy) and recycling equipment.

At the moment, private companies together with local authorities are preparing the construction of a plastics recycling plant near Bogotá and a glass-recycling plant on the Caribbean coast. Upcycling of tires and adequate recycling of refrigerators are also key to professionalizing the value chain of the EPR-schemes.

6.3 Processing of Construction and Demolition (C&D) Waste

To date, in Colombia, only three cities have formal recycling plants for C&D waste. Mid-sized cities are looking for local and regional collection and recycling solutions to solve the problems caused by the illegal dumping of mixed waste in rivers and other ecosystems.

Besides, the construction sector offers opportunities for Dutch companies active in the first phase of the building life cycle. Colombia lacks knowledge on how to close the loop of building materials, starting at the design phase (eco-design). Architects and suppliers of sustainable construction materials can fill this void. More information is presented in the report “*Circular Construction in Colombia: Business Opportunities for Dutch Companies*”, a joint research project between the Netherlands Embassy in Colombia and Holland House.

7 Concluding Remarks

The Colombian waste and circular economy sector is developing quickly, creating multiple business opportunities, especially with private sector entities.

Additional opportunities are in consultancy services, both in waste and circular economy. Bi- and multilateral organizations are increasingly keen on working with Colombia in this area. At this moment, several consultancy projects are being prepared concerning plastics and organic waste with EU funds and the World Bank.

It has to be kept in mind that Dutch equipment and services can be perceived as relatively expensive in Colombia. The value depreciation of the peso relative to the euro in the recent past has not helped this situation. It is therefore important to stress the life cycle costs of products and to look for customers and partners who prefer quality over the lowest investment cost.



COSTA RICA

Country Information

“Switzerland of Central America”. This is how Costa Rica is often described, for its natural beauty and its relative political tranquility. Many Europeans know the country as an attractive tourist destination, with its abundant forests, its range of volcanoes and its beaches along the Pacific and the Caribbean Sea. More than 40% of Costa Ricans live in four provinces in the Central Valley: the capital San José, Alajuela, Heredia and Cartago. This area is also referred to as the “Gran Área Metropolitana” or the GAM. The country has enjoyed steady economic growth over the past years. In part because of its dependency on tourism, Costa Rica has been hit hard by the COVID-19 crisis.

The political stability, relatively high standard of living and well-developed social benefits set Costa Rica apart from most of its Central American neighbors. The country has attracted one of the highest levels of foreign direct investment per capita in Latin America. Still, doing business in Costa Rica does require patience and resilience.

“Pura vida” is what Costa Ricans (aka “Ticos”) say when they meet. Indeed, the country offers much to lead a “Pure life”. But it has its share of challenges in waste management. Much remains to be done.

An important source for this report is a 2019 study carried out by a coalition of Costa Rican organizations and GIZ Germany, meant as a preparation for NAMA projects in waste management (the “NAMA study”).

1. The Waste/CE Market Analysis

1.1 Facts & Figures Waste Generation and Composition

Costa Ricans generated around 1.45 million tons of Municipal Solid Waste in 2018, or 0.81 kilograms per day^{lxxvi}. 60% of this waste is generated in 16 out of the 82 cantons, which are almost exclusively located in the GAM. The composition is 52% organic material, 13% paper and cardboard, 12% plastics, 3% textiles and some smaller fractions (based on an analysis of 10 municipalities as part of the NAMA study).

In 2018, a total of 31,342 tons of Hazardous waste was registered in the Management System for Hazardous

Key Indicators	
Size	Costa Rica is 23% larger than the Netherlands
Population (2019)	5.8 million ^{lxxviii}
Nominal GDP (2019)	USD 62.142 Billions world rank: 79 th ^{lxxix}
GDP per capita (2019)	USD 20,443 ^{lxx}
Import from the NL (2018)	USD 17 million ^{lxxi}
Economic growth (2018)	2.6% ^{lxxii}
Ease of doing business rank (2019)	74/190 ^{lxxiii}
Corruption index (2019)	44/180 ^{lxxiv}
Unemployment rate (2019)	12.4% ^{lxxv}
Currency	Costa Rican Colón (CRC)
Time difference NL	-6/-7 hours

Waste SIGREP^{lxxvii}. The province of Guanacaste stood out with 44.7% of the hazardous waste received.

1.2 Collection and Disposal

1.2.1 Waste Collection

According to the NAMA study, 3,132 tons of waste per day is collected and recycled or sent to landfills. This is 82% of Municipal Waste.

In Costa Rica, municipalities are responsible for collection, transportation and treatment of solid waste. However, only a few municipalities have environmental management systems that allow them to plan their activities properly. 87 out of the 488 districts do not have municipal collection, forcing citizens to resort to

inappropriate practices such as burning garbage, dumping it in vacant lots or bodies of water (Comptroller General of Costa Rica, 2016).

1.2.2 Waste Disposal

Despite the small size of Costa Rica, waste travels fairly large distances. Strategically placed transfer stations could ameliorate this situation. There is also a lack of specific collection equipment for source separation of recyclable waste. A thorough analysis of waste logistics in Costa Rica could yield promising business opportunities, inherently profitable for all involved (including the environment).

According to the Ministry of Health, in 2017 Costa Rica deposited 1.04 million tons of waste in landfills.

The 2019 NAMA study provides a detailed overview of the number and location of (7) sanitary landfills and (numerous) waste dumps in Costa Rica. It also shows which municipality is using which landfill and the associated transport distance. This is definitely a good basis for projects aimed at mitigating climate change.

Most sanitary landfills are in private hands. The Canadian owned company EBI Costa Rica S.A. is a major player. It operates three landfills: La Uruca in San José; El Huaso in Aserrí; and Limón on the Caribbean coast. According to its website, in Costa Rica EBI applies the same standards for landfill management and biogas treatment than in Canada. Another example is the sanitary landfill “Parque Eco Ambiental Miramar” in Puntarenas, managed by a Mexican firm. In contrast, the sanitary landfill in the Northwestern province of Guanacaste is operated by the Municipality of Santa Cruz.

The 2016-2021 Costa Rican Solid Waste Plan (PRESOL) announced the development of regional sanitary landfills based on municipal cooperation and public-private investment. The aim was to gradually close local waste dumps. In the last eight years, 12 landfills have been closed, but only two new ones were put into operation.

The promotion of regional cooperation (including regional landfills) can be a promising field to explore in Costa Rican - Dutch cooperation. The Netherlands has a lot of experience with regional public service waste companies, partial ownership entities and contract

management models. In the slipstream, Dutch companies with expertise in development and revitalization of landfills could step in.

1.3 Value Chain

1.3.1 Recycling

According to a recent study by the Costa Rican Technology Institute (TEC), storage centers for recyclable waste (so called "centros de acopio", registered or non-registered, private or public) are spread throughout the country. Processing plants tend to be located in the central valley. The final destinations for recyclables are export primarily (to other Central American countries with processing facilities but also overseas): 60,193 tons of paper and cardboard; 78,628 tons of metals and 81,125 tons of aluminum in 2019. Plastics were lagging behind with 21,788 tons.

Some barriers to recycling are the low quality of collected materials, the scarcity of local processing capacity, volatile prices and the lack of a market for recycled products. Plus, the modest size of the overall market. The one plant in Costa Rica that is able to process cardboard has been working at 40% capacity for lack of demand. In plastics it is the other way around: there is a lack of collected material. However, low prices for virgin material do not help either. In some cases, informal waste pickers are not able to sell to the storehouses because they don't have the right credentials, which does not help to build up sufficient volume.

The Embassy of the Netherlands supported a project of the Tierra Madre Verde Foundation to build plastic recycling machines designed by the Dutch company Precious Plastic. During PreCOP 25 in Costa Rica, the company had a booth where it showed the operation of a small-scale factory for recycling and manufacturing products out of plastic waste. This model is already being replicated in some communities both to address the problem of pollution and for the development of businesses in plastic recycling.

An inspiring private initiative in recycling is Ecoins. This program encourages Ticos to take their clean, dry and separated valuable materials to one of 287 collection centers. As a reward, they get “virtual money” (Ecoins) that can be exchanged for discounts on products and services from dozens of participating businesses. The program is sponsored by Pepsico and is branching out to

Panama, Peru, Guatemala and El Salvador. There is another program called AmbientaDOS, spearheaded by Kimberly Clark together with the television station TeleTica. In their campaigns, they collect plastics, tetra pack, glass, aluminum, paper and cardboard.

1.3.2 Composting

In the past decade, municipalities and private enterprises have developed initiatives in composting. Some municipalities (especially in the GAM) teach their citizens home composting techniques and provide basic equipment. Other regions have established centralized composting facilities. The biggest plant is located in the canton of Pérez Zeledón, where a total of 3,287 tons of separately collected organic waste from households, restaurants and gardens was processed in 2017. The retail price of the compost is around 100 colones per kilo. The composting plant saved the municipality over € 10,000 on a monthly basis. This may be a driver for further development of composting in Costa Rica. The Nationally Appropriate Mitigation Action (NAMA) plan, the Decarbonization Plan and the National Composting plan of Costa Rica all help to make composting into a potentially fertile business opportunity. On the downside there is the difficulty to collect "clean" organic waste and a lack of a market for the compost.

1.3.3 Waste to Energy

At Two cement companies offer co-processing of waste materials: HOLCIM (through Geocycle) and CEMEX. In 2018, HOLCIM processed 20,000 tons of MSW (1.4% of the total output of Costa Rica). Processing costs vary: € 16-25/ton for spent tires; € 600/ton for pharmaceutical waste.

Costa Rica has the highest electricity rates in Central America (according to GlobalPetrolPrices.com, in March 2020, the costs for electricity were 0.15 US\$/kilowatt-hour (kWh) for households and 0.20 US\$/kWh for businesses). However, the modest waste output of Costa Rica as a whole probably does not justify mass burn incineration. Apparently, the current mayor of San José is interested to explore Waste to Energy, but the national electricity company ICE, a force to be reckoned with in this area, is not.

Anaerobic digestion is primarily limited to the agricultural sector. Six cantons in the Cartago Province

are working towards a regional waste treatment facility including an anaerobic digestion plant. This project may still be halted because of the high investment costs.

2. Governance on Waste/CE

2.1 Waste Management

In 2010, the Costa Rican Government published the Integrated Waste Management Law (Law GIRS8839 and regulations). At the national level, waste policy making, monitoring, evaluation and control was put in the hands of the Ministry of Health (MinSalud).

MinSalud has issued the Costa Rican Solid Waste Plan 2016-2021 (PRESOL). It promotes proper solid waste management along five lines of action: economic, technical, legal, institutional and socio-cultural. Specific strategies for waste separation and valorization (ENSRVR) and for the substitution of plastics (ENSPARC) were also published. With Law 9786 (restrictions on plastic bags, straws and plastic bottles) and Law 9703 (banning polystyrene) Costa Rica is taking the first steps towards a circular economy.

Another important development is the National Climate Change Strategy (ENCC), which contains goals to reduce greenhouse gas emissions and identifies landfills as an important source.

The municipalities are responsible for proper waste management in their jurisdiction. They have to develop and execute Municipal Waste Management Plans, including actions to promote waste separation at source.

2.2 Policy Landscape: Circular Economy

As stated before, the national motto of Costa Rica is “Pura Vida” or “Pure Life”. With this motto in mind, it should be relatively easy for Ticos to take the shortcut towards a circular economy. Indeed, efforts are underway by the Ministry of Economy to formulate a National Circular Economy Strategy. COVID-19 is slowing down these developments but progress is being made.

On the 29th of May 2019, the Holland House Costa Rica (www.hollandhouse.cr, do pay them a visit when you're in the country) announced a half day seminar on “Circular Economy – Business Models to Compete Tomorrow”. Within two hours 150 people had signed up. The main focus was on plastics: Costa Rica contemplates

a ban on single use plastics and an environmental labeling system is in the making. What is missing still is an Extended Producer Responsibility system for packaging (for other waste streams such as tires and WEEE it is already in place).

This Holland House event clearly showed the keen interest of Costa Ricans in Circular Economy. The field appears wide open for collaboration and mutual business in this area.

The Dutch Embassy has been actively promoting Circular Economy by participating in business forums, conferences and seminars with the private sector. Dutch technologies have been showcased and the Dutch Circular Economy Plan 2050 was presented. As a result, the Netherlands is considered a frontrunner on the subject in Costa Rica.

3. Financial Aspects

In many countries, the waste sector is underfinanced. In Costa Rica this is not necessarily the case. In the 2019 NAMA study, a list is provided of the expenditures of Costa Rican municipalities in waste management. Amounts vary from € 18/ton in Sarapi to € 210/ton (almost 12 times as much) in Dota. If these figures are correct, there appears to be sufficient financing for integrated waste management (at least in significant parts of Costa Rica). A more thorough investigation into the financial aspects, with a view to optimize the triangle environment – service level – finance, could pave the way for sustainable waste management in Costa Rica as well as promising business opportunities. Regionalization of waste services could be part of the solutions. Costs could be cut, services improved and the environment would benefit.

4. Stakeholders

In 2020, the German GIZ published a map of Costa Rican enterprises working in ISWM. There is an overview of recovery centers for recyclables, processing companies, waste collectors and transporters, organic waste processors, co-processing and final disposal companies. The informal sector is included as well. This is matched with an overview of the waste management tasks carried out by selected municipalities. Although the authors indicate a lack of data, their report provides

an invaluable overview of the current players in the Costa Rican waste sector.

Some important stakeholders are:

- [ACIPLAST](#)
- [CEGESTI](#)
- [CICR](#)
- [TEC](#)

5. Dutch–Costa Rican Cooperation

The Netherlands is the second largest destination for Costa Rican exports and one of its top foreign investors (e.g. Philips Medical Services and APM Terminals). A bilateral agreement was signed in 2015, looking for partnerships around common interests such as innovation, best practices, knowledge and technology. Waste management and circular economy are a promising field of cooperation.

6. Business Opportunities

Same as other countries, Costa Rica has been hit hard by COVID-19. The unemployment rate hovers around 25%. Waste management and circular economy may not be among the first priorities right now, but they will no doubt return high on the agenda when the pandemic subsides. Apart from some promising fields already mentioned (notably composting), below are some business opportunities considered especially promising.

6.1 Regionalization and Climate Projects

The Costa Rican government aims to close down waste dumps and develop regional sanitary landfills. The high costs of waste management in some parts of the country reveal inefficiencies that could be tackled by more regional cooperation. This could be a promising field of cooperation to be explored by the Netherlands and Costa Rica. The Embassy of the Kingdom of the Netherlands could initiate this cooperation with the Costa Rican Union of Local Governments (UNGL) as a partner. The Netherlands has lots of experience with a variety of regional cooperation models in waste management. Such program could be accompanied by Dutch private sector providers in optimized waste logistics and sustainable landfill design and rehabilitation. The latter projects could be financed in the framework of climate change mitigation programs.

6.2 Data Management

One of the foundations for sustainable waste management and circular economy is good data management. A recurring outcome of the recent NAMA studies has been the lack of complete and consistent data on waste flows in Costa Rica. Plus, large differences in costs of waste management between municipalities. This is another field where the Netherlands has lots of experience: not only in generating the data, also in the analysis, benchmarking and feedback of data to achieve continuous improvement. A cooperative role in data management in the Costa Rican waste sector, spearheaded by the Dutch Embassy, would put the Netherlands in the driver's seat to identify and follow up on business opportunities in the waste/CE sector.

6.3 Processing of Construction and Demolition (C&D) Waste

In terms of weight, Construction & Demolition waste is one of the dominant waste flows in Costa Rica. The municipalities are looking for local and regional collection and recycling solutions to solve the problems caused by the illegal dumping of mixed waste in rivers and other ecosystems.

Besides, the construction sector offers opportunities for Dutch companies active in the first phase of the building life cycle. Costa Rica lacks knowledge on how to close the loop of building materials, starting at the design phase (eco-design). Architects and suppliers of sustainable construction materials can fill this void.

6.4 Circular Economy

The May 29, 2019 circular economy event organized by Holland House Costa Rica has revealed the keen interest in Costa Rica in this subject. Costa Rica and circular economy appear to be compatible. The Ministry of Economy is developing a circular economy strategy – let's step in and lend a hand. This could be followed up with a local Circular Economy Hub and young entrepreneurship programs. The Embassy of the Kingdom of the Netherlands has already laid the groundwork to develop such programs.

7. Concluding Remarks

Though small in size, the challenges Costa Rica is facing on the way towards sustainable waste management and a circular economy are very similar compared to other countries in Latin America. At best, the country can serve as a testing ground for sustainable waste technologies and services. For less common waste streams such as WEEE and batteries, it is recommended to seek cooperation with other Central American countries.



ECUADOR

Country Information

Ecuador is quite small compared to the other countries of the region, as a result the country does not have its own Dutch embassy, it is part of the embassy in Peru. The country has a Dutch consulate, both in Quito and Guayaquil.

Ecuador has undergone an incredible transformation in recent years, passing from an economy based prevalently on trade of raw materials to a modern and diversified economy including activities of the highest technological and industrial level, like the information technology industry.

Ecuador also includes the Galápagos Islands in the Pacific, about 1,000 kilometers west of the mainland. The capital is Quito, a city of 1.8 million inhabitants, located at 2,850 meters above sea level.

1. The Waste/CE Market Analysis

1.1 Facts & Figures Waste Generation and Composition

The National Institute of Statistics and Census (INEC) indicates that the country generates about 14.4 thousand tons of waste per day, which comes down to 0.86 kilograms per day per citizen^{lxxxvi}. In addition, the INEC and the Ministry of Environment and Water (MAE) estimate that 57% of the total waste generated is organic and 43% of the inorganic waste is made up of: plastic 10.6%, cardboard 5.8%, paper 4.4%, non-hazardous sanitary waste 5.1% and other 16.8%^{lxxxvii}.

Besides, INEC reports that 84.5% of the 220 municipalities have a local solid waste management framework, 50.5% have a system for the treatment and / or final disposal of Hazardous waste, 66.2% carry out characterization of their solid waste, 36.5% source separate waste at household level, 37.4% carry out differentiated collection for recyclable waste and 13% of the municipalities organize the treatment of their municipality waste.

In the sector, there are more than 2,000 transport and collection companies, more than 500 companies that

Key Indicators	
Size	Ecuador is 7 times larger than the Netherlands
Population (2019)	27.3 million ^{lxxxviii}
Nominal GDP (2019)	USD 107.4 Billion world rank: 61 st ^{lxxxix}
GDP per capita (2019)	USD 11,878 ^{lxxx}
Import from the NL (2018)	USD 14 million ^{lxxxii}
Economic growth (2018)	1.4% ^{lxxxii}
Ease of doing business rank (2019)	129/190 ^{lxxxiii}
Corruption index (2019)	93/180 ^{lxxxiv}
Unemployment rate (2019)	3.8% ^{lxxxv}
Currency	Dollar (USD)
Time difference NL	-6/-7 hours

classify the waste (waste picker organizations) and approximately 200 companies work in recycling and treatment (MAE-PNGIDS, 2020).

1.2 Collection and Disposal

1.2.1 Waste Collection

In Ecuador, the waste collection is 85.5%, which implies that 14.5% of the waste is not collected. Of the 12,400 tons collected every day, 15% is collected via special routes for non-recycle and recycle waste. The country has a national color- standard for waste separation to stimulate source separation and differentiated collection^{lxxxviii}, which has not been implemented yet. Besides, the city of Cuenca (third largest city, with a population of approximately 300,000) implemented a fine system for citizens who do not separate their waste^{lxxxix}. In the country, 70% of the waste trucks exceed the useful life of 10 years^{xc}.

In Quito, the waste collection is done by the municipality company [Emaseo](#). Besides, the company [EMGIRS-EP](#) operates the two transfer stations, the three construction & demolition (C&D) waste landfills and the 'El Inga' landfill of Quito (DMQ)^{xc}. The North Transfer Station

(NTS) has the highest capacity of waste storage at 1,150 tons per day. NTS is formed by 11 platforms and a transport fleet of 11 trucks with a capacity of 30 tons each. The South Transfer Station has a capacity of 900 tons/day. In a month, 720 trips are made from the South Transfer Station to the landfill. In 2016, the Metropolitan Area of Quito and EMGIRS developed the Master Plan Integral Waste Management of the Metropolitan District of Quito. This plan is a technical framework for municipal solid waste (MSW) management until 2025. The main goal of EMGIRS is to maintain and operate the North and South Transfer Station reducing the amount of MSW going to 'El Inga' landfill^{xcii}.

While in most of the small and medium municipalities the public health departments organize collection and final disposal with their own equipment^{xciii}, bigger cities subcontract (inter)national private companies like [Gadere Veolia](#) (among others in Quito, Cuenca and Guayaquil) and [EMAC](#) (Cuenca).

1.2.2 Waste Disposal

Governments (GADM), 45.7% of the municipalities have landfills, 28.8% dispose their waste in temporary cells and 25.6% in open dumpsites or ecosystems. In Ecuador, there are 144 open dumpsites and 77 landfills. The National Program for the Integral Solid Waste Management planned to close the dumpsites before the end of 2017 but have not started this process until today^{xciv}. This process of closing dumpsites and designing and construction of new landfills is an interesting business opportunity for Dutch companies^{xcv}.

In 2017, 53% of the municipalities carried out differentiated collection of hospital waste. 50% of these municipalities do not have facilities for the treatment or final disposal of this hazardous waste stream^{xcvi}. In 2017, 212 of the 220 municipalities swept 18,248.4 kilometers of streets, which means a coverage of 78% of the roads^{xcvii}.

The landfill of the Metropolitan District of Quito receives approximately 2,000 tons of waste every day from the Metropolitan District and surrounding municipalities through the two transfer stations. This landfill is equipped for groundwater management, leachate management and biogas extraction^{xcviii}, but is facing different problems^{xcix}. EMGIRS-EP charges 26USD/ton at the transfer stations (includes tariff for final disposal) and 15USD for disposal

at the landfill^c. Construction & Demolition waste can be deposited for 0.57 USD/m³.

1.3 Value Chain

1.3.1 Recycling

According to the National Institute of Statistics and Censuses (INEC), only 6% of the municipality waste is recycled nationwide. In 2017, approximately 626,000 tons of cardboard, metal, paper, plastic and glass waste were recycled^{ci}.

In 2015, the national network of waste pickers in Ecuador (RENAREC) stated that there are around 20,000 informal and formal waste pickers, responsible for the collection of recyclable waste^{cii}.

Extended Producer Responsibility (EPR) Programs are implemented for a series of waste streams through the [Ministerial Agreement 161](#), including used tires (2014), containers of agricultural pesticides (2013) and batteries and cell phones (2013). The Agreement obliges producers to meet established collection and/or recycling targets. Failure to do so causes a ban on the sale or import of the product.

The Ministerial Agreement 098 of 2015^{ciii} regulates the extended producer responsibility program for used tires. By 2019, there were about 2.6 million vehicles that generated 3.14 million End of Life Tires, equivalent to 51,266 tons, of which 23,070 tons (45%) were collected by different companies to transform them into other products, such as playgrounds, carpets and synthetic courts or energy. The biggest EPR program is [Seginus](#), representing 80% of the used tires-producer companies. The professionalization of the used tire chain during the next years can offer opportunities for Dutch companies active in this industry, for example offering collection and recycling equipment.

In 2018, Ecuadorians produced 93,000 tons of electrical and electronic waste, that is about 5.4 kilos per person. Only 2% of this amount was recycled^{civ}. The Ministry of the Environment and Water is structuring the technical proposal for the EPR-legislation to increase the formal recycling as soon as possible. At the moment, there are 5 registered EPR E-waste programs, such as: [Reinicia](#), [Reciclamental](#) and [Vertmonde](#), which offer their services to the producers to comply with this legislation. Ecuador does not yet have an EPR program for packaging,

although developments are expected in this regard in the future. In November 2020, the National Assembly approved a new law for the regulation of single-use plastics. The law establishes that in 36 months after publication, the manufacture and import of plastic bags, glasses, utensils and tableware that are not recyclable and whose elaboration does not contain the percentage of recycled raw material as indicated by the norm, will be prohibited. This percentage is gradual and must be incorporated in terms of 18, 36 and 48 months. In the fourth year, the bags must have 60% recycled material, flex foam containers 18%, glasses and packaging 30%, utensils 30%, and PET bottles 30%^{cv}.

The Law of Promotion and Environmental Optimization of the State Income (2011) created a deposit return system on single-use plastic bottles to reduce the environmental pollution and stimulate the recycling process, the value of the tax is established at 2 cents^{cvi}.

There is no law on C&D waste, as a result the waste ends up in special C&D waste landfills or is dumped illegally.

1.3.2 Composting

Ecuador is a country whose economy is based mainly on small and medium agriculture, a sector that offers huge opportunities for Dutch companies concerning valorizing their waste, both agricultural and agro-industrial.

There is no national law or legislation about organic waste certification. The MAE, the European Union and the Italian [Foundation ACRA](#) developed a manual for the use of municipal organic waste for the different Autonomous Decentralized Municipal Governments (GADM)^{cvi}. The manual gives an overview of the different technologies that could be implemented. At the moment, 37.4% of the municipalities of Ecuador valorize the organic solid waste from the fruit & vegetable markets. All the technologies presented in the manual have a long and successful track record in the Netherlands, in this way offering interesting chances to expand their business in Ecuador. The study of Climate and Clean Air Coalition and the company EMGIRS^{cvi} shows that Quito is interested in the implementation of composting projects^{cix}.

1.3.3 Waste to Energy

MAE made waste to energy technologies part of their national program. Some initiatives are being investigated

by the municipalities. In the Pichacay Landfill, Cuenca, for example, 1.6 MWh of energy is estimated to be generated by biogas recovering and driving a thermal power plant. The Dutch company BGP Engineers was part of the consortium, responsible for the study and equipment^{cx}. Other examples of Waste to Energy projects are being studied in Quinde and Quito^{cx}. In Ecuador, the energy is subsidized (to maintain the price of energy produced by the statal hydroelectric power plants low), which makes it difficult to implement renewable energy projects.

2. Governance on Waste/CE

2.1 Waste Management

The MAE is the environmental authority of Ecuador^{cxii}, in cooperation with the Ministry of Production, Foreign Trade, Investment and Fisheries (MPCEIP) they design and implement the legislation concerning waste management and circular economy.

The Organic Code of Territorial Organization, Autonomy and Decentralization^{cxiii} (COOTAD) establishes that the 221 local governments (GADs) are responsible for the municipal solid waste management inside their jurisdiction, which includes designing plan and legislation^{cxiv}.

Ecuador has a National Waste Management Program 2010-2021^{cxv} of which the main objective is to eliminate open dumpsites from all municipalities in the country. At this moment, Ecuador does not have a national waste management law, the most important legislation concerning waste management is the Organic Environment Code (COA). The COA, approved in 2018, promotes the guarantee of a healthy environment and nature right protection^{cxvi}. Chapter 5 of the document describes the general policies of the comprehensive waste management, including municipal, hazardous and special waste.

2.2 Policy Landscape: Circular Economy

Since the beginning of 2019, the MPCEIP, together with the Vice presidency and the MAE, have been working on the roadmap towards a National Circular Economy Strategy. In June 2019, the European Union, in collaboration with ACRA Foundation, organized the first international circular economy seminar^{cxvii} in Quito and in August 2019, a circular economy pact was signed by

161 adherents from the public, private and academic sectors. The main stakeholders meet every 3 months.

On June 25th 2020, the National Government and [Unacem](#), leader in the Ecuadorian cement industry, presented the First phase of the White Paper on Circular Economy^{cxviii}. This first document contains an in-depth analysis of the current situation of the sector and establishes a roadmap for the country to move towards a model of sustainable production and responsible consumption. The White Paper includes strategic lines of action, part of the following 4 fundamental pillars:

- i) Sustainable production
- ii) Responsible consumption
- iii) Comprehensive Waste Management
- iv) Policies and Financing.

Concerning the third pillar, waste management, the report stresses that the main constraints for a successful waste management are:

- weak institutional framework and planning
- lack of institutional culture (public and private)
- lack of information for decision making
- lack of use of information, communication and technology systems (ICT)
- source separation
- market development (supply and demand)
- tariff schemes, which include externalities (environmental and social)
- inclusive recycling.

The Second phase will contain the detailed design of the strategic lines of action. The report is expected to be presented in the first semester of 2021, the second phase will be executed by [German Corporation for International Cooperation GmbH](#) (GIZ) and [University Los Hemisferios](#).

At the same moment, the National Assembly is preparing a Circular Economy and inclusive recycling Law^{cxix}, which seems to be mainly focused on improving the current situation of the waste management sector in Ecuador.

The harbor city and biggest city of Ecuador, Guayaquil, is taking a proactive role towards a circular economy. The University [Espol](#) has organized two international [congresses](#) in which various Dutch experts and Unilever participated.

3. Financial Aspects

The municipalities charge fees for waste collection, transportation, and treatment services, but there are no uniform criteria in determining the fee^{cxx}. 50.7% of the municipalities charge the solid waste collection fee through the electric energy, 23.3% through the water bill, while 7.8% do not have regulations for the collection of the fee^{cxxi}. The fee is around the 10USD^{cxii}. The waste tariffs for final disposal in Quito mentioned before are calculated based on real costs of operating an official landfill, which makes it interesting for Dutch companies to present their equipment and discuss return on investment versus short term purchase price^{cxiii}.

Since the municipalities do not collect sufficient financial resources from the citizens to sustain the municipal waste management, they added municipal subsidies to finance on average 43.9% of the service. The implementation of a EPR (packaging) system could help the municipalities finance their municipal waste management and take steps towards a circular economy. A project managed by ACRA Foundation and AME, funded by the European Union, created a software to help municipalities calculate the correct tariff based on the real costs and incomes. The software has been implemented in 10 pilot municipalities and is looking for funds to finance the implementation.

Since 2007, the European Union has financed waste management projects for almost 15 million euros, additionally during 2021 the EU will finance circular economy projects^{cxv}. There are several international organizations helping Ecuador financially with the design and implementation of waste management and circular economy projects. For example, the International Development Bank finances projects on inclusive recycling in Ecuador through the [Regional Recycling Initiative](#), as well as the German Development Bank [KfW](#) and GIZ. At national level, the [State Bank](#) finances these types of projects.

4. Stakeholders

As showed before, there is a strong relationship between the private and public sector in Ecuador. The private organizations are member of the [Federation of the Chamber of Industries](#) , which groups together companies from 62 productive sectors, and the [Ecuadorian Business Committee](#). The Plastic producers are united in the Plastic Association [Aseplas](#).

The Italian [Fundación ACRA](#), plays an important role in the design of the circular economy strategy by organizing the National Forum of Circular Economy and supporting municipalities with the design of their waste management plans^{cxvii}.

Coca - Cola's largest bottler [Arca Continental](#) leads the application of SDG 12: Responsible Consumption and Production. Currently their containers incorporate 25% recycled resin, recover 79% of their PET bottles and provide 25% consumption of Ecuadorian recycled resin.

Also, the academic sector in Ecuador plays an important role, and universities like [Catholic University Pontificia](#), [ESPOCH](#), [ESPOL](#) can be of interest for Dutch players to get to know the long term vision of the policy development.

5. Dutch–Ecuadorian Cooperation

In 2015, together with Emaseo, [VDL Translift](#) implemented a side loader collection scheme with 550 containers, 19 collection trucks and 5 washing machine trucks in Quito^{cxviii}.

Besides, the Dutch specialized company [EES Engineers](#) B.V. with focus on Energy Engineering Solutions is active in Ecuador.

6. Business Opportunities

In Ecuador, business opportunities are abundant in the waste/CE sector. Let's single out some prominent ones.

The White Paper prioritized the following five sectors for the implementation of circular economy, which gives a clear indication of the long-term vision of the country and opportunities for Dutch companies:

- Manufacturing
- Agriculture
- Commerce
- Construction
- Oil & Mining industry

The potential of the country is mainly based in the 3 cities: Quito, Guayaquil and Cuenca. The territorial fragmentation of small municipalities requires the creation of joint management to have profitable and sustainable systems (economy of scale), so small-scale Dutch solutions are interesting for local partners.

7. Concluding Remarks

Although the country has some important steps to make in order to improve their current waste management situation (collection and landfills), Ecuador is showing a strategic vision on how to further progress towards a circular economy. The private sector seems the most promising sector for Dutch companies.



MEXICO

Country Information

Whilst Mexico is known for its delightful and spicy food, its mariachi bands and its fantastic beach destinations such as Cancun and Acapulco. Drug cartels are also part of this list, unfortunately. The size of Mexico and its diversity are daunting. On average, the 32 Mexican states are bigger in size than the Netherlands. With around 23 million inhabitants, Mexico City Metropolitan Area is one of the biggest urban centers in the world, with all the associated challenges in public services such as waste management.

The new president, Mr. Lopez Obrador, is focused on boosting social spending and public investment, while maintaining fiscal caution. The previous administration focused on promoting affordable and clean energy. For the current administration however, this is not a priority. This administration is working on improving its financial uncertainty because of a slow economic growth recovery, which has worsened due to the COVID-19 crisis^{cxxxvi}

Key Indicators	
Size	Mexico is 47 times larger than the Netherlands
Population (2019)	127.6 million ^{cxxviii}
Nominal GDP (2019)	USD 1,260 Billion world rank: 15 th ^{cxxix}
GDP per capita (2019)	USD 20,582 ^{cxxx}
Import from the NL (2018)	USD 198 million ^{cxxxi}
Economic growth (2018)	-2.5% ^{cxxxii}
Ease of doing business rank (2019)	60/190 ^{cxxxiii}
Corruption index (2019)	130/180 ^{cxxxiv}
Unemployment rate (2019)	3.5% ^{cxxxv}
Currency	Mexican Peso
Time difference NL	-7/-6/-5 hours

1. The Waste/CE Market Analysis

1.1 Facts & Figures Waste Generation and Composition

In 2017, Mexico generated around 44 million^{cxxxvii} tons of waste, or 0.94 kilograms per person per day. The State of Mexico, Mexico City and Jalisco together generate 28.5% of the country's waste. Approximately 10% of the solid waste generated in Mexico's cities is recycled (Secretariat for the Environment and Natural Resources, [SEMARNAT](#), 2010), whereas 70% ends up in landfills and the remaining 20% is disposed of in illegal dumpsites. (Mexican Institute for Statistics and Geography INEGI, 2018). 70% is household waste, 30% comes from other sources. SEMARNAT reports in 2020 that 46% of the waste is organic in nature, which is relatively low compared to other countries studied by the project team. Moreover, 32% of the waste could be recycled (e.g., cardboard, paper, plastics, glasses) and

22% is residual waste.^{cxxxviii} Another significant waste stream is Construction and Demolition (C&D) waste, with 6.5 million tons generated annually (SEMARNAT, 2020). Mexico's hospital waste output is around 11,634 tons per year (average figure for 2004-2018). The installed capacity in 38 authorized companies to treat this waste (through incineration, autoclaves etc.) appears to be sufficient. Over 1.1 million tons of e-waste was produced in 2015. 28,900 million tires are disposed of every year, 5% of which get recycled^{cxxxix}.

1.2 Collection and Disposal

1.2.1 Waste Collection

The Mexico City Metropolitan Area is one of the biggest urban centers in the world. The waste collection coverage there is 100%. The states of Colima, Baja California Sur, Michoacán, Nayarit, Quintana Roo and Sinaloa have the same good coverage. This is why in this report we mainly concentrate on urban waste. In the

whole country, the average waste collection coverage rate is 87%^{cxli}. In most cases, waste is collected with equipment in poor conditions, not suitable for the collection of source-separated waste. In communities with over 10,000 inhabitants, the private sector is in charge of 41% of the collection services^{cxlii}. In smaller communities, the public sector does 98%^{cxliii} of the collection. All-over Mexico, a total of 2,516 waste collection service providers are active. Of these, 87% are public entities, 10% private and 3% belongs to the informal sector. 179 out of the 2,467 municipalities are not serviced at all.

Source separated waste collection has been introduced in 144 municipalities of 24 states, such as Mexico City, the State of Mexico and Jalisco, among others. This creates a market for more sophisticated collection and storage equipment. To date, there are very few selective collection plants, which contributes to the low recycling rate. According to SEMARNAT (2020), there are 127 waste transfer stations in the country. In 71 of these the waste is merely transferred onto bigger trucks, whereas in 56 it is also compressed and/or sorted.

1.2.2 Waste Disposal

In 2017, in Mexico, 86,350 tons of waste per day were deposited at 2,203 final disposal sites^{cxliiii}. This is almost 72% of the total waste output of the country. The remainder apparently leaks out of the waste chain through illegal dumping, burning etc. 40% of the deposited waste ends up in 82 (bigger) landfills with basic infrastructure in place. Some of these landfills could be suitable for application of biogas extraction and electricity generation in the framework of climate change mitigation measures. This is considered a promising opportunity for Dutch companies. 685 (smaller) sites are basically waste dumps without infrastructure. 1,440 landfills are full and 736 municipalities do not have a dumpsite at all. With landfilling being the final destination of choice for waste in Mexico, there is a lot to do in this sector. Opportunities for Dutch companies include equipment for the extension of the useful life of landfills, the introduction of waste diversion techniques such as post collection separation and the development of new sustainable landfills. In Mexico, due to the COVID-19 crisis, the generation of health waste is 32 tons per day^{cxliiv}. Mexico has 19 incinerators capacity to handle

117,519 tons per year and it has designed a temporary landfill for biological-infectious hazardous waste. At the moment the amount of plastic waste due to lockdowns is increasing rapidly. The promotion of new models of behavior and consumption is essential.

1.3 Value Chain

1.3.1 Recycling

In Mexico, there are 1,060 collection centers for recyclable materials in 21 states^{cxlv}. Dry recyclables are treated in 44 of these collection centers. The recyclable waste separation plants are not (yet) financially self-sufficient. They operate thanks to subsidies granted by the federal authorities. There are approximately 5,000 waste pickers (or “pepenadores”). This is not a lot compared to other countries in the region. There are initiatives to integrate these waste pickers in a more formal system of recycling, such as [PETSTART](#). This initiative seeks to improve collection and thus recycling. Unfortunately, not all waste pickers are interested to join in. The pepenadores often are part of an informal network that recycles and sells valuable waste materials to unknown buyers. This situation has hindered foreign investments. If Mexico wants to formalize the sector and increase recycling, the next steps should be “pricing” waste by means of landfill taxation (in the longer term), landfill bans and introducing Extended Producer Responsibility^{cxlvi}

1.3.2 Composting

As stated previously, organic waste makes up 46% of the total in Mexico. There are 24 plants for the treatment of organic waste (considering urban, agricultural, livestock and forestry sectors). 19 of these plants carry out composting and five of them bio-digestion. Seven composting plants are located in Mexico City, another four composting plants are located in the State of Mexico. The [Bordo Poniente](#) composting plant processes an average 1,374 tons per day of organic waste. 1,251 tons per day comes from home collection and large generators, with a compost production of 269 tons per day. The other plants in Mexico City together process 26 tons per day^{cxlvii}. Puebla has two anaerobic digestion plants. One of these plants is considered to be the most advanced municipal solid waste (MSW) processing plant in Mexico [developed by Van Dyk](#) solutions. This is a Dutch company which markets

Bollegraaf/Lubo equipment and recently expanded its services to Latin America. There is a lack of expertise on composting technologies to recover nutrients from food waste and the organic fraction of MSW. Mexico can benefit from Dutch knowledge and technology in modern high performing composting facilities such as wet and dry anaerobic digestion, source separated organics, and food waste or manure.

1.3.3 Waste to Energy

Mexico has a legal framework that allows the generation and commercialization of electricity by private parties. However, waste to energy (W2E) is still largely unexplored. The Energy Secretariat (SENER) has stated that by 2031, 56 GW of new capacity will have to be added to the power grid. 38.2% of total power has to be generated through clean sources by then. Waste to Energy could become a useful component of the clean energy mix. However, the Mexican Transition Law does not consider waste as a source of clean energy (except biomass residues).

The Mexico City Metropolitan Area produces sufficient waste to justify a feasibility study for large scale waste incineration. Mexico City has performed a feasibility study to design a large-scale thermal-valorization plant, called “[El Sarape](#)”. However, this project was cancelled due to the high costs of implementation^{exlviii}. The current administration has been investing in the economic recovery of [PEMEX](#) and [CFE](#) which are the main energy companies in the country. An adverse effect of this is that it makes it harder for private sector players in renewable energy to compete on the energy market. On top of that, several biogas plants have failed because of a lack of expertise. Momentum is building for a 400 tons per day [MSW biogas plant in the municipality of Naucalpan](#), which is backed up with feasibility studies funded by GIZ, the US and the Climate and Clean Air Coalition (CCAC)^{exlix}. Additionally, Veolia has partnered in Mexico in some municipalities with small-scale plants that represent lower investment risks for the company. [The plant in San Luis Potosí](#) is one of these initiatives. For these kinds of projects to scale up there is a need for municipalities to be willing to work with the private sector. In addition, mechanisms to protect private companies by means of concessions should be developed (with long term operation periods, guaranteed delivery of waste and at fixed prices).

So far in Mexico, landfills and energy-rich residues produced by large companies (from the tequila, corn milling and meat industry) are sparsely used as a source of biogas or combustion. There are 8 to 10 landfills in Mexico where biogas is used as a source of energy. SIMEPRODE in Monterrey is the biggest. This field offers opportunities to Dutch companies, which have expertise in the extraction and use of gas from landfills. It is recommendable to start with off-grid applications with the Mexican private sector. In some cases, business models are inherently profitable, especially if applied in the framework of climate change mitigation measures.

2. Governance on Waste/CE

2.1 Waste Management

In Mexico, the waste management sector is organized according to three types of waste. Firstly, municipalities are responsible for the management of municipal solid waste (MSW). Secondly, states are in charge of special waste streams such as tires, C&D waste, water treatment sludges, etc. Lastly, federal authorities organize the management of hazardous waste (including medical waste). In the Mexican system, with some exceptions the 2,457 municipalities do not charge fees for the collection, treatment and disposal of waste, which is an impediment to correct waste management. Municipal councils change every three years, affecting the vision, planning and waste management projects. The Secretariat of Environment and Natural Resources ([SEMARNAT](#)) does make an effort to professionalize the waste management sector. The Mexican municipalities consist of a small network of local offices with untrained staff and financial challenges. However, our findings suggest that municipalities can help investors overcome local, social and cultural barriers.

The General Law for the Prevention and Comprehensive Management of Waste (2003) promotes the recovery of waste and minimizes the impact on the environment and on human health. In 2009, the federal government published the National Program for the Prevention and Management of Waste (PNPGIR) which has increased the participation of the states, municipalities and the private sector in waste management. However, progress is still incipient and requires constant government actions to improve waste management systems. The National Vision towards Sustainable Management:

[National Zero Waste Vision](#) (2019) is another initiative which addresses circular economy, commitment to anti-corruption and transparency in public management and social welfare. In Mexico, Extended Producer Responsibility (EPR) is not yet being applied as a policy instrument in waste management. Formally, there is only a shared responsibility for the producer since 2003. SEMARNAT and UNDP are carrying out the study: “A proposal for the implementation of EPR for waste of electronic devices”^{cl}. If this initiative evolves into an EPR system for WEEE, followed by other recyclables, then a new array of opportunities will open up for Dutch exporters.

2.2 Policy Landscape: Circular Economy

In 2019, the [state government of Mexico City announced an Action Plan for Circular Economy](#). The main objective is to achieve zero waste. This plan introduces regulations to reduce the amount of packaging and single-use products, proper waste management processes and infrastructure, the creation of cooperatives and microenterprises specializing in waste management, as well as zero-plastic waste education campaigns^{cli}. At a federal level, there is an ongoing [policy initiative](#) to promote circular economy in the water and energy sector. However, there are many legal and investment challenges to overcome^{clii}.

3. Financial Aspects

The waste sector in Mexico is underfinanced. The cost of waste management has to be covered through general municipal funds mostly. At some point, it is important to create a federal law that makes it compulsory for the municipalities to collect a waste fee. In Mexico, in the period 2013-2018, USD 2,373 millions of federal funds were allocated to finance 346 projects in support of integrated waste management. Currently the investment in the sector has decreased, especially as a result of COVID-19. The energy transition and sustainable use of energy fund (FOTEASE) plays a role in Waste to Energy projects. The National Bank of Public Works and Public Services financially supports the solid waste program (PRESOL). External sources of funding include the Global Environmental Facility (GEF), the World Bank (WB), the Inter-American Development Bank (IDB) and the European Investment Bank (EIB).

4. Stakeholders

In Mexico, 247 private companies offer waste collection, transportation and disposal services. Of the 127 registered transfer stations, 29 are operated by the private sector. The only specific management system for special waste is operated by private providers. However, not all generators of this type of waste contract the services of private companies, as they tend to be more expensive than the municipalities. The reason for this is that private companies often calculate projects with a higher internal rate of return (IRR). Often, public services do not pay a value added tax, which gives them a competitive advantage.

The following organizations play an important role in the sector: [ANIPAC](#), [ANILLAC](#), [CNBIOGAS](#), [CANIETI](#), [ANFAD](#), [Veolia Mexico](#), [PETSTAR](#), [ANIQ](#)

5. Dutch–Mexican Cooperation

In 2018, The Netherlands and Mexico signed six agreements that will strengthen commercial relations and cooperation in the management of natural resources, infrastructure and trade^{cliii}. Additionally, in 2020, Mexico and the Netherlands have joined forces to promote innovation in the horticultural sector by holding a trade mission aimed at enhancing technological cooperation and expanding trade between both nations, given their advances in innovation in agriculture. An example of this cooperation is the applied research on the Mexican greenhouse industry to develop a sustainable Agro-food chain, financially supported by [Topsector Agri & Food](#)^{cliv}.

6. Business Opportunities

There are plenty of business opportunities for Dutch companies in the waste and circular economy sector in Mexico. Please find below the most important opportunities identified.

6.1 Processing of Organic Waste from Municipal, Industrial and Agricultural Sources

Mexico’s food losses amount to 37% of the food produced in the country. Clearly there is opportunity and a need to improve food waste management. There are several initiatives in composting and anaerobic digestion but the country lacks knowledge on how to scale up the application of these technologies and develop new

business models. In addition, in Mexico there is a lot of untapped potential when it comes to the waste of the tequila, corn milling, meat and dairy sectors as a source of compost and biogas production. This potential is the product of the lack of both will and legal stability, lack of trained staff and financial resources to implement energy recovery projects. However, Dutch technology suppliers can support Mexico in the valorization of organic waste. Examples are: digestion (source of renewable energy and the digestate as fertilizer) or high-end valorization of organic waste into biobased products (biobased plastics). Same for the landfill's gas extraction. Dutch companies have a lot of expertise in these areas, and can introduce business models that are inherently profitable.

6.2 Recycling Technologies, for EPR Packaging, Tires and Waste Electrical and Electronic Equipment (WEEE)

In the coming years, it is expected that Extended Producer Responsibility (EPR-) systems for WEEE, tires and packaging waste must be developed and implemented, together with clear recycling targets. The amount of e-waste is growing rapidly from the current 2.52 kg per person per year. Its management leaves much to be desired. Only 5% of used tires are currently recycled. There is a lot of experience with handling these waste streams in the Netherlands. Therefore, there is an opportunity for Dutch companies to introduce these techniques in Mexico. In 2005, the packaging industry in Mexico signed the Global Pact. As a result, substantial investment and great changes are expected within the value chain. Private companies (including multinationals) will be looking for quality equipment (collection, sorting, upgrading and application in the production process) and collaborative approaches in the value chain, which is a key expertise of Dutch companies.

6.3 Processing of Construction and Demolition (C&D) Waste

The volume of Construction and Demolition (C&D) waste is increasing fast. Stationary and mobile C&D waste processing plants have been introduced in Mexico. Stationary plants have a typical capacity of between 100 to 350 tons/h. The initial investment in such plants is very high. Mobile plants typically do 100 tons/h through

more basic technologies. They are economically feasible, but the recycled product tends to be of a lower quality. Given the low reuse and recycling percentages of C&D waste in Mexico, opportunities are high for the installation of crushing plants and the selection of aggregates for their future use in construction or civil works. Besides, the construction sector offers opportunities for Dutch companies active in the first phase of the building life cycle. Mexico lacks knowledge on how to close the loop of building materials, starting at the design phase (eco-design). Dutch architects and suppliers of sustainable construction materials can fill this void.

7. Concluding Remarks

The Mexican waste and circular economy sector is developing slowly but steadily, creating promising business opportunities, especially with private sector entities. Some opportunities are in consultancy services, both in waste management and the circular economy. The national government needs to update its legal structure for special waste management which currently does not allow for its integrated utilization. There is a need to formalize and to transform the role of the informal sector which is essential for increasing efficiency in both recycling and material recovery in the country. Additionally, there is a need for reliable data systems and improvement of regional municipal cooperation, and a need to invest in and operate waste collection, transport and treatment/disposal. In both areas, the public and private players from the Netherlands have a lot to offer.

The Mexican market is characterized by complexity. The lack of transparency in the waste management processes can be a barrier. For example, the bidding processes are neither open nor monitored. Additionally, the needed high investments and the short tender period do not always match. However, Dutch companies usually do not provide solutions for the whole chain. Therefore, Dutch companies can team up with local or other foreign companies to become more successful. Another factor that adds complexity is the lack of regulation and enforcement to provide stability and protection to foreign private companies.



PANAMA

Country Information

Panama is twice as big as the Netherlands, it has only 4 million inhabitants, of which 1.5 million live in the capital, Panama City.

The country has positioned itself as the ‘Hub of the Americas’ due to its central location, excellent connections and favorable business climate. This regional trade, logistics and financial center has attracted many Dutch businesses.

Over the years, the Panamanian economy has been able to maintain high growth figures. Panama ranks among the fastest growing economy in Latin America. In addition, it has the highest GDP per capita (PPP) of Latin America.

According to the World Bank, the COVID-19 pandemic is hitting the country hard. The contraction of the aggregate demand and a sharp decline in government revenues have a negative impact on the economy during 2020.

Key Indicators	
Size	Panama is 82% larger than the Netherlands
Population (2019)	4.2 million ^{clv}
Nominal GDP (2019)	USD 66.8 Billion world rank: 73 ^{rdclvi}
GDP per capita (2019)	USD 32,850 ^{clvii}
Import from the NL (2018)	USD 12 million ^{clviii}
Economic growth (2019)	3.0% ^{clix}
Ease of doing business rank (2019)	86/190 ^{clx}
Corruption index (2019)	101/180 ^{clxi}
Unemployment rate (2019)	7.1% ^{clxii}
Currency	Balboa (USD)
Time difference NL	-6/-7 hours

1. The Waste/CE Market Analysis

1.1 Facts & Figures Waste Generation and Composition

In 2016, Panamanians generated 1.2 kilograms per day of waste, which on a national level is about 5,000 tons per day, or 1,830,000 tons per year. It is estimated that 74% of the population’s waste ends up in landfills. These figures are based on the preparatory studies of the Spanish consultancy company INECO (Ingeniería y Economía del Transporte S.A.) which in 2017 elaborated the Panamanian Plan for Integrated Waste Management 2017 - 2027. The rest of the waste gets incinerated in an uncontrolled manner and/or is dumped into rivers and other ecosystems. Almost half of the collected garbage ends up in the Cerro Patacón landfill of Panama City.

The country generates around 480,000 used tires in a year, of which around 350,000 ends up in Cerro Patacón (INECO, 2017). In Panama City, 1 million m³ of Construction & Demolition (C&D) waste is generated per year. 53,000 tons per year of C&D waste is disposed

of in Cerro Patacón (INECO, 2017). According to the program BasuraCero (Zero Waste), Panama City recycles around 5%. Official numbers are not available. The only waste stream that is processed in the country itself is carton. The rest of the collected recyclables are exported.

1.2 Collection and Disposal

1.2.1 Waste Collection

Waste collection is the responsibility of the municipalities, either through their own means (46 districts) or by concession companies (13 districts). 66% of the population is served this way (INECO, 2017). In the eight biggest cities, the collection is carried out by private companies. All of these follow the same approach, which is having a user fee billing system, around 5 USD per month. In rural areas, the population density is low, therefore collection is very expensive.

1.2.2 Waste Disposal

The country has 63 landfills. In 89% of them, illegal dumping of hazardous waste takes place and in 82%

burnings on site. Only three landfills have a scale to weigh the waste (INECO, 2017). The Cerro Patacón landfill of Panama City receives around 2.400 tons per day of Municipal Waste (almost half the nation's output), as well as 30 tons per day of hospital waste and 53,000 tons per year of Construction & Demolition waste. Numbers on other industrial and special waste streams are unknown. All in all, the importance of the Cerro Patacón landfill is obvious. This is the first stop for Dutch companies interested in working on landfill rehabilitation in Panama.

Tipping fees at Cerro Patacón^{clxiii} amount to 17 USD per ton for Industrial waste, 14.30 USD per ton for institutions and Special waste, 14.50 USD per ton for Construction & Demolition waste and 11 USD per ton for Municipal Waste collected by the National Waste Authority (AAUD)^{clxiv}. The landfill is operated by the Colombian waste company Interaseo. Their Panamanian branch is called Urbalia Panamá S.A. The municipality of Chorrera, next to Panama City, has the only landfill that complies with all national regulations. This landfill is managed by the French waste company Veolia.

No formal legislation exists for special waste streams, so most of these materials are dumped at illegal dumpsites or burned. There are companies specialized in collection and disposal of hospital waste, but since this stream is also lacking control, it is not clear which percentage of hospital waste gets treated adequately.

1.3 Value Chain

1.3.1 Recycling

According to the National Waste Management Plan of 2017 (INECO, 2017), 89% of Panamanians do not separate their waste and none of the municipalities have separated collection routes for recyclable waste. Same as in other Latin American countries, informal separation and collection does exist, however, in Panama it is a rather small sector. Waste pickers are present in a couple of neighborhoods in Panama City and at landfills, where they mainly collect aluminum.

In 2015, the municipality of Panama City, in cooperation with the private sector, started the BasuraCero program. BasuraCero is a recycling initiative designed for the period 2015 – 2035. The objective of the program is to reduce waste disposal through the implementation of the so-called 3 Rs (reduce, reuse and recycle), through

awareness programs, regulations and institutional strengthening^{clxv}. Since 2015, the program inaugurated 31 recycling centers, where the citizens of Panama City can hand in their recyclable waste.



It is estimated that Panama generates 89 tons per day (32,598 tons per year) of e-waste (INECO, 2017). In February 2016, a draft version of the law that will regulate e-waste was presented but it has not been finalized yet.

Since environmental awareness of (multi)national companies is increasing, the country has several industrial waste collection companies. Panama has a local capacity to process carton. Because of the modest amounts collected, most of the other recyclable waste is exported. Neighboring countries such as Costa Rica and Colombia do have a recycling industry, so it is cheaper to export the materials. Other destinations are the USA and China.

1.3.2 Composting

Panama City generates approximately 122,000 tons of organic (food) waste each year. This is one of the major problems of the sector. Although the national government does not have any policy to promote the separate collection of municipal organic waste, BasuraCero set the target for the Municipality of Panamá to reduce food waste by 10% between 2015 and 2020^{clxvi}. The municipality is preparing the implementation of this program at a marketplace in the old city center. There may be scope here for food waste collection and processing programs which are inherently profitable.

In the industrial sector, things are changing. As an example, companies are investigating the possibilities of biodigesters to transform their food waste. Korean equipment has been installed in several companies^{clxvii}. There may be opportunities for Dutch equipment as well.

1.3.3 Waste to Energy

Waste to Energy (W2E) is not considered a feasible option at this moment in Panama, due to the lack of a policy framework. In 2016, the government presented a proposal for a W2E-law, but this version has not been further elaborated^{clxviii}.

2. Governance on Waste/CE

2.1 Waste Management

In Panama, the Ministry of Health (MINSAs) is responsible for municipal waste policies. As part of the implementation of Law 51 of 2010^{clxix}, 10 years ago the government founded the National Waste Authority (AAUD). This entity is responsible for the administration, planning, operation and inspection of municipal, commercial, and industrial waste management as well as the landfills. Interestingly, the same organization is also responsible for waste collection in Panama City. AAUD faces difficulties to fulfil this double role. As a result, collection in Panama City has not seen any progress in the past years. The board of directors of AAUD is headed by the Minister of Health and the Director of the Sanitation Authority.

In 2015, the Ministry of Environment (MiAmbiente) was created. It is now part of the board of AAUD. MiAmbiente represents the Republic of Panama in (inter)national organizations concerning waste issues and promotes and facilitates environmental projects. The specific responsibilities of MINSAs and MiAmbiente are not clearly defined by the regulations.

In November 2015, AAUD contracted the Spanish company INECO to design a master plan for the national waste sector. The goal was to determine the guidelines, objectives and primary lines of action for sustainable waste management. The resulting plan provides an interesting overview of the current situation in Panama and draws the following key conclusions^{clxx}:

- There is a great quantity and variety of regulations, creating legal uncertainties, reducing clarity and causing inefficiencies and complexities in their application.
- In the regulations there is a notable absence of homogeneous definitions and terms and a lack of

defining the different management roles and the actors involved.

INECO proposed the elaboration of an Integrated Waste Management Law. The Panamanian government presented the draft of such law “that regulates the integrated waste management of the Republic of Panama as an essential issue of public health”.

The law passed the first debate in July 2019^{clxxi} and now must go through the 2nd and 3rd debates in the National Assembly before it can be signed (in 2021 at the earliest) by the President of the Republic.

In February 2018 Law 6 was published^{clxxii}. This law regulates the integrated management of solid waste in public institutions, among others defining responsibilities and obligations concerning recyclable materials. To date, it has not been implemented^{clxxiii}.

In March 2018, a law on Zero Waste was published. This law provides an integrated waste management framework based on the concept of circular economy. The goals are to achieve the best economic, environmental and social use of waste and natural resources, to generate new job opportunities (inclusion of waste pickers) and to reduce pollution and impacts on health and the environment^{clxxiv}. It defines responsibilities for all actors (individuals, public and private sector) that produce, import, commercialize or consume products or deposit waste. It also creates a National Education Program to promote a Zero Waste Culture (3Rs).

In October 2019, the Ministry of Environment launched the Electronic Waste Project in Panama (PREAL). The amount of 550,000 USD was reserved for its execution in the period 2019-2024^{clxxv}.

The national government presented first versions of laws concerning used tires, collection of e-waste and recycling in mass events^{clxxvi}. In 2019, a law was presented concerning single use plastics, with the objective: “Regulating the Reduction and Progressive Replacement of Single-Use Plastics by 2021”^{clxxvii}.

The National Tourism Council (CNT), the main public-private body for the tourism sector in Panama, has recently approved the Master Plan for Sustainable Tourism 2020 - 2025^{clxxviii}. Through this plan, the Panama Tourism Authority (ATP) re-launches the country as a tourist destination post COVID-19. The

Master Plan concludes that virtually all priority destinations have urgent shortcomings in basic urban infrastructure, including solid waste treatment. The plan includes activities to improve waste management at tourist sites and to reduce single-use plastics. This Master Plan can be a stimulus for local governments to review waste management in their constituency, as well as to start with campaigns for their citizens.

In conclusion, the Panamanian government has been working on several laws and decrees to promote sustainable waste management. However, almost none of the laws have been implemented, activities have not been planned, and real responsibilities (and control) have not been assigned to the local governments.

2.2 Policy Landscape: Circular Economy

In October 2019, the Ministry of Environment signed an agreement with the Industrial Union (Sindicato de Industriales) and the National Council of Private Business (CONEP) to create a Circular Economy Centre^{clxxix}. This is a first step in the design of a circular economy strategy. The partners are now defining how this center will work and investigating financing possibilities.

3. Financial Aspects

Since the country has not yet implemented EPR-norms or a landfill tax, the only sources of financing for the waste sector are the household fees for collection and landfilling plus additional financing by the municipalities. The waste invoice is part of the water bill. By law, Panamanians have a right to drinking water, so in case they do not pay the waste fee their water does not get disconnected. Taking into account the low payment discipline for the waste service, Panama only collects 8% of waste fees on time.

Given that the waste sector is not a priority in the country, it can be difficult to obtain subsidies or credits for waste management projects.

4. Stakeholders

Since 1945, Industrial Union for consistency (SIP) represents the industry in Panama. Every year they organize an International Symposium on Sustainability. This can be a useful event to get to know the Panamanian industry and their (sustainability) plans and needs. SIP

organized a first event on circular economy in November 2020. Besides, the following organizations play an important role in the sector:

- [AmCham](#)
- [CONEP](#)
- [ANCON](#)

Interestingly, most of the waste collection and recycling companies active in Panama are Colombian companies or their owners are Colombians. This makes Panama a potentially effective steppingstone towards Colombia or the other way around.

Within the recycling sector there are different foundations promoting the sector, for example [CIAM](#) (United Nations), [Fundación MareaVerde](#), [Costa Recicla Foundation](#) and [La Camara Panameña de Reciclaje](#).

5. Dutch–Panamanian Cooperation

In 2017, a waste management mission was organized by the Dutch embassy in cooperation with the embassy in Colombia. A one-week trip was organized to Cartagena and Panama City. In Panama, a visit to the landfill was made and the general manager of AAUD presented the results of the INECO study. The second day, a match-making event between Panamanian and Dutch companies was organized. Unfortunately, this has not yet led to Dutch Panamanian business on waste management.

The current bilateral cooperation is mainly focused on the water and port sectors. In 2019, a Holland House was opened in Panama, which offers services to companies interested in expanding their business to Panama.

6. Business Opportunities

Even though there is lack of government interest and a weak regulatory framework, there are business opportunities in the waste/CE sector.

6.1 Collection and Landfill

On a national level, the country is lacking an urgency to move away from the current situation of collection and landfilling/illegal dumping towards a circular economy approach. According to several persons interviewed, the current situation is basically the same as during the 50's and 60's. However, there are a lot more people generating a lot more waste. A structural “problem” the country is

facing is the low overall volume of waste generated. With only 4 million inhabitants in a country double the size of the Netherlands, collection and treatment of waste is relatively expensive. It is perhaps the reason why only carton waste is recycled nationally, while other recyclables are exported.

The central waste authority AAUD is eager to improve the waste sector but faces serious challenges. Therefore, it is recommended to focus on private (waste) companies. As an example, the INECO study made it clear that investments in equipment for leachate treatment at Cerro Patacón landfill are necessary^{clxxx}. Besides, (pilot) projects on collection and recycling could be developed together with local waste companies (which may have their headquarters in Colombia). Opportunities in organic waste processing (including food waste, such as biofuels out of cooking grease from restaurants) may be the low hanging fruit here.

6.2 Circular Economy

With the organization of the first circular economy event in November 2020, SIP took a proactive role in the implementation of circular economy. It is recommended that Dutch companies investigate, together with SIP, the long-term circular economy plans of SIP members. During the November 2020 event, organizations such as the International Development Bank, the National Beer Company, Nestlé, CocaCola Femsa, Tetra Pak, MiAmbiente, the International Renewable Energy Agency and the Ministry of Commerce and Industry discussed the importance of renewable energy, food logistics and how to include circular economy in the reactivation of the economy after COVID-19.

7. Concluding Remarks

In conclusion, the Panamanian government, first of all, has to regulate the national policy framework, including standards on collection, transport and final disposal for all waste streams (municipal, commercial and industrial). Besides, it has to define the responsibilities of the private sector (EPR-systems). The country needs recycling targets, which should be part of local waste management plans, including financing. Only this way the country can move towards sustainable waste management. And only then the country will be ready to seriously work on a circular economy strategy.

The Netherlands can play an important role in the design of this waste management framework and circular economy strategy, but it is important to make informed choices before financing such important steps.

Country Information

Peru is famous for its culture, the ancient Inca city of Machu Picchu and its delicious raw fish dish called ceviche. The country, bordered by Colombia, Ecuador, Brazil, Bolivia and Chile, is rich in natural resources such as copper, silver, lead, zinc, oil and gold. Peru's economic development has in large part been driven by this abundance and by the high commodity prices on the global market (MVO Nederland, 2017).

The capital (and main) city Lima is home to 10 million out of the 31.8 million Peruvians. The city is divided into 43 districts, which all have full autonomy regarding waste management.

1. The Waste/CE Market Analysis

1.1 Facts & Figures Waste Generation and Composition

In 2018, Peru produced 7.3 million tons of Municipal Waste, or 0.63 kilograms per person per day. 57.7% was organic waste; 18.3% recyclables such as plastic, aluminum and paper; and 24.1% was residual waste^{clxxxix}. Of the 20,000 tons of garbage produced daily, a third is generated in Lima. According to official data, only 1% of the municipal waste is being valorized; 4% of the dry recyclable waste and 1% of organics^{exc}. Information is scarce and mostly limited to the formal sector, even though the informal sector recycles more than the formal sector.

Additionally, 28.9 million tons of non-Municipal Waste per year is generated, 59.5% of which comes from industry, 16.1% from agriculture and 9.5% from mining (National Environmental Action Plan 2011-2021 PLANAA).

1.2 Collection and Disposal

1.2.1 Waste Collection

Peru has a Municipal Solid Waste collection coverage of 93.7%. However, in 80% of the municipalities the waste

Key Indicators	
Size	Peru is 31 times larger than the Netherlands
Population (2019)	33.2 million ^{clxxxi}
Nominal GDP (2019)	USD 230.7 Billion world rank: 50 ^{thclxxxii}
GDP per capita (2019)	USD 13,416 ^{clxxxiii}
Import from the NL (2018)	USD 49 million ^{clxxxiv}
Economic growth (2018)	4% ^{clxxxv}
Ease of doing business rank (2019)	76/190 ^{clxxxvi}
Corruption index (2019)	101/180 ^{clxxxvii}
Unemployment rate (2019)	6.6% ^{clxxxviii}
Currency	Sol (S)
Time difference NL	-6/-7 hours

ends up at dumpsites (PLANAA). Only 6.4% of the districts (119 out of the 1874) dispose of their solid waste at controlled landfills. However, these 119 districts are important in terms of volume. 49.2% of the total amount of Municipal Solid Waste (MSW) is generated there. Officially, almost 15% of the municipalities practice open air burning of the waste, but in practice most of the municipalities have an illegal dumpsite, since it is cheaper.

In some medium-sized cities other private companies collect and transport the waste to the landfill, such as the French companies [Seche](#) and [Veolia](#) and the Colombian company [Interaseo](#). Companies interested in offering waste management services must be officially registered at the Ministry of Environment (MINAM). The list of companies can be found [here](#).

1.2.2 Waste Disposal

All in all, the country has 52 landfills (four of which in Lima) and 1,585 dumpsites. 98% of the dumpsites should be closed while 2% could be converted into official landfills^{exci}. Because of their extensive knowledge, Dutch consultancy and equipment producer companies can play an important role in this process.

In Lima, the collection of 9000 ton of municipality domestic waste is carried out daily by six private companies. [Innova](#) and [Petramas](#) operate both two of the four landfills. The municipalities are the owners of the landfills and determine which company gets to operate them. The tipping fee for waste companies is approximately € 3.95/ton.

Hospital waste is disposed in the landfill, at a separate location, but without further measures. Lima has two small incinerators for hospital waste.

1.3 Value Chain

1.3.1 Recycling

In Peru, there are more than 98,000 informal waste pickers, and only 1,800 formal ones^{excii}. As a result of the “Waste Pickers Law” (Law No. 29419), local governments primarily focus on informal waste pickers in their recycling plans. As a result, most of the organizations are (in)formal small companies, which makes it rather difficult for Dutch companies to find business opportunities in the collection of municipal recyclable waste.

The separation of organic and inorganic waste is underdeveloped and, in most cases, does not take place at all (MVO Nederland, 2017). As a result, the national government implemented a strategy on source separation with the local governments (PLANAA). If the municipalities comply with their goals, they receive money from the Ministry of Economics and Finance (MEF), as established in the Decree N° 362-2019-EF^{exciii}. The implementation of selective collection systems can offer opportunities for Dutch equipment producers, but as well for organisations that specialize in data management.

When it comes to special waste streams, the country has taken first important steps. For example, Extended Producer Responsibility (EPR)-legislation for E-waste was implemented in 2012, then updated in 2019^{exciv}. This legislation establishes that 50% of used electronics has to be treated and recycled adequately in 2017, rising to 100% in 2021. In addition, in May 2013 the National Superintendency of State Assets has approved a national directive for the adequate discharge and treatment of E-waste of public entities. This is around 30% of the total E-waste^{excv}. Although the national government has regulated E-waste, in most cities the E-waste is still

dumped along with domestic solid waste, or delivered to one of the three national recycling plants, located in Lima (PLANAA). Control and enforcement are weak, among others because of lack of human resources.

In October 2020, MINAM presented a draft version of EPR-legislation on tires^{excvi}. A final version is expected soon. This legislation will open new markets for Dutch companies in tire recycling. In the third year after approval of the law there will be a 15% recycling target.

The Peruvian government is also working on EPR-legislation for batteries. This legislation is expected to be presented by the end of 2020 or beginning 2021. As for packaging waste, the country decided to first gather information on how much packaging waste is being produced and by whom before implementing this EPR-legislation. The Netherlands, being one of the first country that implemented this legislation, could take a proactive role in defining the framework, data gathering and supporting packaging producers.

An inspiring example of Peruvian-Dutch cooperation in plastics recycling is already in full swing. Banana plantations in Peru use plastic bags to protect the bananas from bugs and enhance fruit growth. These bags tend to end up in the environment after use. The Dutch banana supplier Agrofair, the consultancy company WASTE and the technology provider Plastic Fantastic have teamed up to develop corner boards out of recycled plastics to protect the banana pellets during shipment. The first recycling line has now been placed at one of Agrofair’s banana suppliers. The corner boards are being produced, saving a lot of virgin plastic.

In Peru, the management of construction and demolition waste (C&D waste) is regulated since 2013^{excvii}. The Ministry of Housing obliges producers to present a waste management plan annually, which includes among others amount of waste produced, a strategy on classification, separate collection and final disposal and education campaigns. However, to date the country does not have any Construction & Demolition waste recycling facility. As a result, Construction & Demolition waste ends up in landfills or is dumped illegally, for example at designated beaches. In October 2020, the Ministry of Housing presented a new law^{excviii} to incentivize the valorization of Construction & Demolition waste and the use of recycled building materials. The design of this law

and the demand for (recycling) infrastructure offer promising business opportunities for Dutch companies.

1.3.2 Composting

Agri-food is one of the biggest economic activities in Peru and also one of the largest exporting sectors, especially to the Netherlands. According to MVO Nederland (2017), for many Dutch (start-up) companies it is of great interest to invest in the valorization of agri-food residue streams in Peru, both from an economic and an environmental perspective. As an example, experts from Wageningen UR and TNO are already looking for opportunities to apply their expertise in Peru. Last year, the Dutch Agricultural Counsellor^{ccix} participated with several Dutch companies in the biggest Latin American Poultry Congress. Among other options they presented solutions for the valorization of organic waste.

On the other hand, the national government^{cc} obliges municipalities to properly treat and use their organic waste. The compost must be used to improve the soil of municipal parks and gardens^{cci}. Sectoral experts indicate that Peruvian companies are looking for solutions to process fruit, vegetables, fish and seafood for composting and animal feed.

1.3.3 Waste to Energy

Waste to Energy has been applied in Peru in a sense that the company Petramas installed a power plant at the Huaycoloro landfill site near Lima (Worldbank, 2012). The grid connected system converted methane of the landfill into 4 Mega Watts of clean electricity, enough to power 9,000 homes. This project was carried out under the Netherlands Clean Development Mechanism Facility. The carbon credits helped to sustain the project. A similar project was carried out at the former waste dump known as La Cucaracha in the Municipality of Callao.

The Ohio based company Eco Waste Solutions installed a Waste to Energy batch system facility for a mining community of 1,600 in the Alto Chicama region of Peru. 2 tons of solid waste and 250 l of liquids per day are being processed in parallel through a pyrolysis process.

To date there is no large-scale waste incineration facility in Peru, although Lima appears to have the appropriate size for it. The Peruvian Government has not yet developed a strategy to implement this.

2. Governance on Waste/CE

2.1 Waste Management

The Ministry of Environment (MINAM), created in 2008, is responsible for the National Solid Waste policy. It has designed and implemented the national solid waste management plan (PLANRES) and supports the provincial (PIGARS) and district (PMRS) solid waste management plans. The PIGARS 2015-2025^{ccii} of the Municipality of Lima is the most important local plan.

The National Environmental Plan 2011-2021 (PLANAA) of MINAM includes specific guidelines on waste management and a special chapter on promoting public and private investment in the sector. The PLANAA specifies the following goals for 2021:

- 100% of the non-recyclable waste is treated and disposed of adequately
- 100% of reusable solid waste is recycled
- Compared to 2012, the generation of hazardous waste is reduced by 20%
- 100% of hazardous waste is treated properly and disposed of in appropriate facilities

It is clear that these goals will not be met by 2021, but no doubt it is important and useful to aim high.

The PLANRES^{cciii} 2016-2024 was developed by the government, in partnership with the United Nations and 800 stakeholders from the public, private and civil society sectors representing a total of 271 institutions in Peru.

The Ministry of Production (PRODUCE) formulates, executes and supervises the national and sectoral Industrial policies^{cciv}. In the field of waste management, the Ministry works together with MINAM in the supervision and control of the EPR framework and the management of several funds.

Decree n° 1278, published in December 2016, regulates the Law on the Integrated Management of Solid Waste and lays the foundation for the transition towards a circular economy. In May 2020, this law was updated. The new version n° 1501^{ccv} facilitates the reactivation of the economy after the pandemic. It contains several important changes^{ccvi} which make it easier for companies to recycle their solid waste. The obligation that the waste

must be collected and transported by official service providers was skipped. Companies now can deliver their waste to formal recyclers' associations. Besides, the new law includes less strict requirements for waste collection centers and allows companies to valorize their organic waste (<2tons per day) without a license. The latter change can make it easier for Dutch companies to offer their small scale and mobile equipment. In addition, the Decree1278 makes it possible to exchange C&D waste between construction projects without a license.

In December 2018, Law n° 30884 was approved. This law regulates the use of single use plastics as well as plastic packaging. It introduces the obligation for producers to use at least 15% postconsumer recycled material in PET bottles starting 2022. It also defines incentives for replacing single use plastic bags by reusable ones^{ccvii}.

In Peru, the different ministries are responsible for the waste that is generated in their sector. The Ministry of Economy and Finance (MEF) plays an important role in financing the different waste programs designed by MINAM., in 2018 220 million USD in incentives were given.

2.2 Policy Landscape: Circular Economy

The National Competitiveness and Productivity Plan 2019 – 2030^{ccviii} includes the objective to “generate the conditions for the transition towards a circular and eco-efficient economy”. As a follow-up to this, MEF is preparing two so called roadmaps: one for the industrial sectors and another one with guidelines for fishing and agriculture.

At the end of 2018, the National Society of Industries (SNI) launched a Circular Economy Commission. The main objective was to find out how the Peruvian industries are going to make the shift towards circular economy models. The Commission consists of Coca Cola Peru, Pamolsa, Owen Illinois Peru, Nestlé Peru, OPP Film, the Cooperation of Plastic industries and Tetra Pak Peru^{ccix}.

The SNI worked together with MINAM and PRODUCE to prepare the Circular Economy Roadmap for the Industry. This Roadmap was approved and presented by the national government in February 2020^{ccx}. Currently, the government is developing the Roadmap for the

fishing and agriculture sectors (due by the end of this year).

In January 2019 Peru signed the New Plastics Economy Global Commitment, promoted by the Ellen MacArthur Foundation.

3. Financial Aspects

In Peru, citizens pay their fee for collection and final disposal directly to the municipality as part of the municipal tax. This appears to be a good arrangement but in practice, only 18% of residents pay for waste management (MVO, 2017). The new waste management law allows municipalities to charge the waste tax through the electricity or water bill.

Various funds can be used to implement waste management projects:

- National Environment Fund – [FONAM](#)
- National Fund for Science and Technology – [FINCYT](#)
- Fund for the Promotion of Regional and Local Public Investment - [FIDT](#)
- The National Program of Innovation for Competitiveness and Productivity: [Innovate Perú](#).

Additionally, companies can use their income taxes to invest in infrastructure projects^{ccxi}.

4. Stakeholders

As presented in the report, the private sector in Peru plays an important role in the transition towards a circular economy. Many companies have been involved in the design of the national waste management policy and the roadmaps. In many cases the Government expects the private sector to play an active and risk-taking role in the development of infrastructure for waste management projects through Public Private Partnerships (PPP's). For Dutch companies this means that by default they will have to work with and through Peruvian partner companies, as they are not likely to enter as investment partners themselves.

Peru has the following important private associations:

- [National Society of Industries](#)
- Foreign trade society: [ComexPerú](#)

- [National Quality Institute](#)

Like many Latin American countries, Peru has an NGO created by multinational companies to finance the implementation of recycling projects. In Peru, this organization is called [Reciclame](#). Overall, companies in the beverage sector such as Coca Cola and Arca Continental Lindley are taking a frontrunners role by implementing waste management and circular economy projects^{ccxii}. These companies also tend to be member of one or multiple committees of the national society of industries or one of the [chambers of commerce](#).

5. Dutch–Peruvian Cooperation

Verstappen Environmental Consultancy and five subcontractors from the Netherlands and Peru (private sector and NGO's) are executing the study “Solid Waste Management Peru, Lima and Piura”. The main activities include waste characterizations, optimization of existing landfills and methane extraction, design of new landfills, rehabilitation of illegal dumpsites and organizing the involvement of the informal recycling sector. The project takes place between 2019 and 2021 and is carried out in close cooperation with the Netherlands Embassy and RVO.

Bart van Hoof of the University los Andes in Bogotá is helping the Peruvian government with the design of the national circular economy strategy.

6. Business Opportunities

After their study in Cusco in 2017, MVO Nederland concluded that in Peru there is the will to work on the waste issue, but the challenges are as yet numerous. These include a lack of technical know-how and hardware, an absence of efficient logistics and limited resources of local governments to tackle the challenges at hand (in terms of budget as well as human resources). As a result, the following business opportunities were singled out.

6.1 Sustainable landfilling

Most of the waste in the country is still deposited in dumpsites and only a small fraction of municipality waste is valorized. The process of closing illegal dumpsites and designing and implementing of landfills that meet official requirements is part of the Dutch waste management history. Hopefully, the ongoing study of

Verstappen Environmental Consultancy will shed additional light on specific opportunities for Dutch companies concerning the sustainable management of landfilling.

6.2 Processing of Organic Waste

The scope and importance of the agriculture sector makes the valorization of agri-food residue streams in Peru an interesting market for Dutch companies. Dutch companies no doubt can contribute useful know-how and infrastructure for efficient organic waste management, for municipal as well as the industrial sector. Promising areas include small-scale and mobile equipment for the processing of organic waste, for example of municipal marketplaces.

6.3 Tire recycling and C&D waste

In Peru, the management of special waste streams is not fully developed yet. Dutch consultancy companies and providers of equipment can help the country with the development of these frameworks, business models and equipment. For example, the design of necessary EPR systems and offering solutions for tire recycling and recycling infrastructure for C&D waste to enhance a circular economy.

7. Concluding remarks

Since 2017, the government has made big steps forward by introducing the first circular economy roadmap, the updated waste management law 1501 and the C&D waste valorization legislation. Additional steps should be taken by the different ministries and their sectors to have a sustainable waste management system, in not only the principal cities but as well in the rural areas. Afterwards, the country will be ready to implement a circular economy strategy.

Chapter 3: The Netherlands: Small country, Big in waste

“Waste does not exist”. This is the slogan of a Dutch waste company, meaning: what we once considered waste, actually, is a valuable resource.

The Dutch Government adopted in 2014 a similar approach in its policy “From Waste to Resources”: recycling of municipal solid waste should increase to 75% in 2020. Another 2020 goal is to lower the annual residual waste output to 100 kgs per citizen.

September 2016, the Dutch government presented an inter-governmental national circular economy program “The Netherlands Circular in 2050”. It envisions fully decoupling economic growth from resource utilization. The drivers behind this vision are not just ecological, they are just as well economical.

To achieve these goals, the Netherlands has to take action at every level of society and set clear objectives. The first objective is ambitious but achievable: a 50% reduction in the use of non-renewable raw materials like minerals, fossil-based fuels and metals by 2030. In order to turn the set objectives for 2030 and 2050 into reality, the government signed circular economy agreements with a variety of stakeholders. On January 24th 2017, the Raw Material Agreement was signed and in January 2018, five Transition Agendas for Biomass & Food, Plastics, Consumer goods, Construction sector and Manufacturing Industry were completed. In June 2018, the Dutch government endorsed these Transition Agendas. Soon after, the Implementation Plan 2019-2023 was published, including short and mid-term actions.

In the Netherlands, we are definitely not starting from scratch. In the 1970s, waste management was put structurally on the Dutch administrative agenda. In the 1990s, a transition took place in the waste sector, from a small scaled, inefficient and regionally organized activity to where we are today: a professional, internationally oriented and increasingly innovative sector. The results are impressive: nowadays around 81% of the waste is recycled, 16% incinerated and only 2%-3% is landfilled.



In a circular economy we are not only dealing with the last part of the chain, being recycling and recovery of waste, but with the entire cycle including design, production, usage and the waste phase. The focus on eco-design includes the development of new business models and smarter and more efficient products (which last longer, consume less energy and are easy to repair and/or to refurbish).

A successful move towards a circular economy requires a solid foundation in sustainable waste management. In a 2013 EU-wide study, the European Union ranked the Netherlands together with Austria as the best performers in municipal solid waste management. Lack of space and a growing environmental awareness forced the Dutch Government early on to take measures to virtually eliminate landfilling of waste. This gave the private sector the confidence to invest more in sustainable solutions.

Dutch waste policy has five important elements:

1. The order of preference (the waste hierarchy)

The Dutch approach has been the 3Rs concept for long, but has been extended to the 10Rs in the CE program: refuse, rethink, reduce, re-use, repair, refurbish, remanufacture, repurpose, recycle and recover (energy) and only then re-mine (meaning: landfill) the residues. Other new elements in the CE program include eco-design, design for disassembly, sustainable procurement and substitution of products with services.

2. Strict waste treatment standards

For instance: standards for soil protection from landfilling, standards for the quality of secondary materials derived from waste (building materials), air quality standards for incineration, quality standards for organic fertilizers (from bio-waste), a ban on landfill for 45 waste-streams (waste streams that are suitable for recycling or incineration are not allowed on landfills).

3. Cooperative approach

In the Netherlands, cooperation is considered key to effective waste management. Therefore, in 1990, the Waste Management Council was established. A voluntary agreement was signed between the three tiers of government to achieve a joint and coherent national approach in waste management. This Council stopped in 2006 because all targets were met. Cooperation between the different tiers of government continues however in defining policies, implementation and enforcement.

4. Extended Producer Responsibility (EPR)

EPR means that producers and importers are (co-)responsible for the end-of-life stage of the products that they put on the market. In the Netherlands, this responsibility is agreed upon voluntarily or through legislation (for WEEE, batteries/accumulators, End of Life Vehicles, car tires, packaging waste and plain glass). EPR is generally applied in combination with other instruments, e.g., landfill bans and landfill taxes. In a circular economy, EPR plays an important role to define the roles of the different stakeholders, implement the polluter pays principle and finance the waste management and recycling chain. Over time, EPR can be expanded to more product categories. Modulated fees can be introduced. For example, for the difficult to recycle (packaging) materials, producers will have to pay a higher fee, which helps to pave the way for design for recycling. Even mandatory minimum percentages for recycled materials in new products are foreseen as part of EPR agreements, if the market does not take up these recycled materials for price reasons.

5. Various instruments to promote prevention and recycling

In the Netherlands, several financial instruments are applied, such as landfill taxes, combustion tax and volume-based waste fees. The tax in 2020 is at a level of €32 per ton for both landfilling and incineration.

Economic steering instruments are considered effective to help steer the waste towards the desired type of treatment.

On average, households in the Netherlands pay less than €240 municipal waste tax per year per family. Close to 50% of the municipalities have introduced volume-based waste fee systems for household waste, also known as variable waste charging (or “pay as you throw”). As a result, Municipal Solid Waste (MSW) recycling rates in these municipalities tend to be above average whereas total waste fees are lower.

Effective recycling starts with easily accessible and user-friendly waste collection systems, including systems for separate collection of recyclables such as organic waste, paper and cardboard, plastics, drinking cartons (tetra packs) and glass. Every municipality needs to have at least one household waste recovery center (HWRC) for (bulky) waste (or one for every 100,000 citizens in case of large cities). The latest trend is “reverse collection”. It includes a service incentive by optimizing collection systems and collection frequency for recyclables but downscaling the service for non-recyclables.

A key element is raising community awareness through communication and education. It is essential to engage the public and to provide the necessary feedback on how successful (or not) these separate collection and diversion programs are and what they mean in terms of environmental quality or monetary savings.

Last, but not least: enforcement of legislation. An elaborate waste tracking and monitoring system is in place to support enforcement.

Separate collection of waste has led to the development of advanced collection and logistics systems and vehicles. Nowadays, in the Netherlands, especially in the center of (historic) large cities, above ground containers have been replaced by **underground containers** for recyclables such as paper, glass and plastics as well as residual waste. This system is aesthetically pleasing, more hygienic and more efficient (*VDL Translift, GeesinkNorba, Royal Dutch Bammens, Klike, van Schijndel*). Companies like *Sulo, WSS and Bammens* have developed systems for volume-based waste fees. *HYVA* provides compacting systems, collection vehicles and waste transfer stations.

Separation techniques to purify, sort and separate different waste streams (from e-waste to residual and construction & demolition (C&D) waste) have a long tradition. Waste can be sorted and separated in many ways, by crushing and sieving, air separation, magnetic force, eddy current, heavy media separation, magnetic plates with magnetic liquids, near infrared techniques etc. An extensive infrastructure of separation plants is in place. These plants process C&D waste, commercial and industrial waste, bulky household waste, commingled recyclables and plastic packaging waste. Dutch companies also have much experience in producing **Solid Recovered Fuel (SRF)** from mixed wastes. SRF is a promising waste management option that makes optimized use of the calorific value of non-recyclables. Outstanding companies in this area include *Bakker Magnetics, Boa Recycling Equipment, Banzo, Bollegraaf-Lubo, Europe Recycling Equipment, Goudsmit, Machinefabriek Emmen, Nihot, N.M. Heilig, Colubris Redox and Waste Treatment Technologies*.

Plastic recycling is designed and operated by a.o. *Van Werven, Kras, Morssinkhof, Suez, Attero, Omrin, Daly Plastics, Precious plastic, Save Plastic, Umincorp and Upp! Upcycling plastics*. Some Dutch companies are also active in collecting plastics from rivers and oceans like *Plastic whale, The Oceans Cleanup (Interceptor) and Clear Rivers*.

The Netherlands is home to internationally renowned consultancy companies such as *Arcadis, Sweco, Royal HaskoningDHV, Tebodin, Witteveen+Bos, TNO and Tauw* with extensive expertise in (feasibility) studies and the design of waste management systems. ICT support systems are provided by companies such as *AMCS/GMT (Clear) and NMPO/Jewel (Vista)*.

Hazardous waste: *Afvalstoffen Terminal Moerdijk* treats contaminated sludge, hazardous waste (paints) and liquid waste (tanker cleaning) in a fully integrated plant through pyrolysis, rotary kiln and a water treatment plant. *REKO* produces new aggregates and filler out of C&D waste and contaminated tar asphalt and contaminated soil. *Remondis Argentia* is specialized in the recovery of precious metals from waste, *Inter-chem* collects, treats all kinds of hazardous wastes, *Bredox* is specialized in recovery of solvents.

Ravo produces top segment **street sweepers** which are operating from Amsterdam to Rome and Cologne to Bogotá.

Extended Producer Responsibility organizations have been set up in the nineties to deal with different waste components. The government intervened in a way that collective schemes had to be implemented for consumer waste. The Netherlands has one (non-profit) recovery organization for each waste stream. Car recycling is organized by *ARN*, recycling of e-waste by *Wecycle*, collection/recycling of packaging waste (including plastics) by *Afvalfonds Verpakkingen*, collection/recycling of batteries by *Stibat*. These organizations can be considered chain managers. They organize and monitor the system by contracting all operations (collection, recycling, etc).

Energy from Waste. Only non-recyclable residual waste is incinerated and will generate electricity, heat and steam (including for district heating). All 12 Dutch Waste-to-Energy (WtE) plants are very innovative and state of the art. There is no risk for dioxin emissions and all plants meet high energy efficiency criteria (100% of the Dutch capacity meets the European R1 criteria). Many of these plants also incinerate waste from abroad (e.g., UK and Italy). *AWECT* provides services for WtE projects and consults governments on strategies for waste management in a circular society. Companies like *Blue Phoenix, Boskalis Environmental* and *NRC Non-Ferro Recovery Company* focus on the recycling of bottom ashes.

As stated before, the companies mentioned are examples. There are more Dutch product and service suppliers to the waste sector.

Chapter 5: Conclusions and Recommendations

I. General Conclusions

1. A helicopter view of the evolution of the waste management sector starts with (1) collection (waste out of the way for health reasons), (2) control and technical fix (focus on environmental protection through e.g., controlled landfills), (3) integrated policies (diversion from landfills through e.g., recycling and EPR) and (4) circular economy (integrated chain approach and waste as a resource). In this low-resolution analysis, the impression of the project team is that the eight countries studied hover around stage 2. This means that **waste collection tends to be pretty well organized** with good coverage, but **waste disposal leaves much to be desired** and recycling rates are as yet low. This is the arena which Dutch exporters of products, services and expertise in waste management and circular economy are entering when setting foot in Latin America.

2. The waste management and circular economy sector is highly dependent on good **governance, planning and enforcement**. All the investigated countries have a national waste management framework, half of them have adopted Extended Producer Responsibility (EPR) legislation and some countries even have a circular economy strategy or roadmap. No doubt these are important and promising developments, but target setting and particularly enforcement is still poor. The lack of regulation and enforcement means private companies never know if their market and/or concession is stable and protected. There is always a risk that lower treatment options (in terms of the waste hierarchy) will be allowed or not be enforced.

3. In all countries studied (albeit to varying degrees), **informal waste pickers still play an important role** in the collection of recyclables. As a result, recycling rates are low; only materials with a positive market value are collected. The informal sector has made important first steps in recycling, but it is time to professionalize collection, increase the scale of recycling activities and improve working conditions. Authorities will have an important role to play: “pricing” waste by means of landfill taxes, landfill bans and EPR. When these policies are introduced waste pickers can become employees or even entrepreneurs in the expanding markets, because there is a benefit to be gained by collecting and processing recyclable materials. For Dutch exporters, this transition is key from a market opportunity perspective.



Source: Photo by Refikad on Unsplash, 2021

4. Considering the stage that the waste management sector has reached in the target countries (see conclusion 1), **waste disposal sites** are a prime concern. Apart from the problem of illegal waste dumping and burning, too much waste still ends up in small uncontrolled dump sites where it threatens (human) health, groundwater quality and the environment. Small landfills are not the solution. It is important to centralize landfills and increase the scale of operation. Therefore, many countries are developing plans to close illegal dumps and move towards regional controlled landfills. In this process, they are facing problems of land scarcity, increasing public resistance and sometimes political differences between municipalities. Problems are getting worse and the pressure to solve them is mounting. Dutch companies and public institutions can step in with products, expertise and solutions that are highly replicable between countries.
5. The largest component of Municipal Solid Waste (MSW) - **the organics** – are still sparsely recovered and treated, causing many of the problems on the waste dumps (methane emissions, leachate polluting the subsoils and pest animals spreading diseases). This is definitely a promising area for Dutch companies in composting, anaerobic digestion and other organic waste treatment techniques. Climate change mitigation programs can be a vehicle to get things in motion. Using the compost to enhance the organic content in soils prevents deterioration of the soil quality and increases crop production. Organic waste treatment can solve a waste problem, a soil problem, an air problem and even an energy problem in one go.
6. **Construction and Demolition (C&D)** waste is getting higher on the agenda of authorities in the countries studied, since it is a big part of the overall waste stream, especially in terms of weight. Representatives of the waste sector in the countries studied are asking for options to properly treat and reuse C&D waste. Traditionally, C&D waste has been used a lot in the foundation for roads (and indeed, many roads in Latin America could use a solid basis) and as granulates in new construction materials. However, business models that are valid in the Netherlands would need a serious makeover before application in Latin America.
7. Same as in many places in the world, **packaging materials and especially plastics** are making it to the priority list of the authorities in the countries studied. As an example, two years ago, the Colombian Industry Association ANDI developed a strategy to implement a nationwide system of Extended Producer Responsibility (EPR) for Packaging. This was done with the help of a team of Dutch experts, which goes to show that Dutch-Latin cooperation in this field already exists. As recycling targets rise in the coming years initiated by regulation and EPR, the need for professional collection and recycling systems will increase, creating a myriad of business opportunities for Dutch suppliers of sorting and recycling equipment.
8. Authorities in the target countries are becoming increasingly aware of the specific challenges surrounding special waste streams such as **e-waste, mattresses and pharmaceutical/hospital waste**. The relatively small quantities (especially in countries such as Costa Rica and Panama) mean that in some cases (same as in Europe), proper treatment will have to be organized on a trans-national scale.
9. The project team found that in most countries, the **waste management sector is underfinanced**. Seven out of the eight countries do not have a waste tariff framework in which citizens pay a waste tariff or a waste tax based on real costs. As a result, citizens are not aware of the costs of waste management services and have no incentive to minimize these. Additionally, financial and economic tools such as landfill taxes or EPR -legislation are often not in place. Therefore, public authorities are reluctant to grant concessions for treatment (a guarantee for minimum delivery of waste per year at a minimum price for a certain time). Concessions reduce the risks for the investors and give them an opportunity to earn back their investments. There is a lot of ground to cover in this area.
10. As the saying goes in the Netherlands: “*to measure is to know*”. **Proper data management** is the very foundation of sustainable waste management. The project team found that in none of the target countries waste management data is collected and managed adequately and consistently.

11. In all target countries, there is a **lack of public awareness and education** concerning source separation and reducing the generation of waste. From a business point of view, public awareness may sometimes be a nuisance in the short term, but in the long term it almost always turns out to be a positive driver for change.

In most target countries the project team encountered a keen interest in the concept of the **circular economy**. In some cases (e.g., Colombia and Chile) a CE strategy has been developed, in others this is still in a preparatory stage.

II. Conclusions by Country

Many of the general conclusions presented above apply for a lot (if not all) of the target countries of this study. At the end of each country's profile, conclusions have been drawn for that particular country and what they mean in terms of business opportunities for the Dutch private sector. Below is a short summary (in alphabetical order) of the main challenges mentioned in the 5-pagers.

Argentina – the vast agricultural sector offers many opportunities for organic waste processing, including e.g., anaerobic digestion. Argentina is making headway with the first EPR systems, which will create new opportunities in waste separation and recycling. With a business model tailored to the Argentina situation, C&D waste processing will be a promising field. An adjacent field worth mentioning is circular wastewater solutions.

Chile - the potential for the processing of organic waste through composting, anaerobic digestion and other (including small scale) applications is still underutilized in Chile. EPR regulation is well underway and the more ambitious recycling targets create a market for more sophisticated Dutch sorting and recycling equipment. In C&D waste, there is a lack of expertise in the processing of recycled minerals. With more emphasis on design and also aggregate standards local market demand in cities might develop.

Colombia - In Colombia, Dutch entrepreneurs can build on the reputation that the Netherlands has been able to build up through the Partners for International Business program in Waste and Water and associated activities (2014-2016). Specific opportunities exist in organic waste and all the waste streams (plastics, e-waste, tires, refrigerators, etc.) that are subject to nascent EPR schemes. C&D waste is another area to look into.

Costa Rica – Focus areas for action in Costa Rica are the processing of organic waste, regionalization of waste services (including closure of waste dumps and development of sanitary landfills), improved waste data management, C&D waste processing strategies and innovative circular economy programs.

Ecuador - In the coming years, waste collection and landfills will be upgraded. It is recommended to partner with the private sector. There is a clear vision of which sectors will be prioritized in implementing the circular economy: manufacturing, agriculture, commerce, construction and the oil and mining industry. This is where opportunities are most likely to emerge.

Mexico - there is high potential to process organic waste into compost or through anaerobic digestion. Many landfills are waiting for gas extraction systems to be installed, which could be inherently profitable systems. EPR systems for packaging waste, WEEE and tires are on the way and will yield business opportunities in the near future.

Panama – It is recommended to focus primarily on business and cooperation with private sector players. The Cerro Patacón landfill needs to be upgraded. Organic waste processing is considered the low hanging fruit. Circular economy (including recycling) projects can be set up together with the Industry Syndicate and the associated (large) companies such as Nestlé and Coca Cola.

Peru - Promising areas for business include sustainable landfilling, small-scale and mobile equipment for the processing of organic waste, and business models and equipment for tire recycling and construction and demolition waste.

III. Launching the Maturity Matrix for Waste and Circular Economy

In the framework of this study, the project team launches a **new tool** for Dutch exporters to compare destination countries for exports through the so-called Maturity Matrix for Waste and Circular Economy.

The **Maturity Matrix for Waste and Circular Economy** is a tool to quickly compare waste and circular economy markets. The basis for comparison is a set of general and a set of waste/CE-specific indicators. The scoring is quantitative or qualitative in nature. The matrix is meant for Dutch exporters of equipment, services and expertise. The tool will help them to decide which countries offer the most interesting opportunities for their specific portfolio.

The Maturity Matrix can be applied to other markets as well. Annex I offers a full explanation of the maturity matrix. A list of conclusions and observations per indicator is presented below. Yellow indicators are general in nature; green ones are quantitative waste/CE indicators and blue ones are qualitative waste/CE indicators.

#	Indicator	Observations and conclusions
1	Population 2018	With around 125 million inhabitants, Mexico is the most populous country in the group. Panama is the least populated with 4.2 million. For some technologies such as incineration Panama is too small. In contrast, Mexico may be approached region by region.
2	GNI/capita 2018	Argentina scores relatively low, Panama the highest. In general: one would expect to be able to sell more high-end equipment in a more affluent country.
3	GDP growth in 2018	All countries had a positive GDP growth of 0%-5% in 2018, except Argentina with -2.5%. A healthy GDP growth is considered key to investments in waste/CE. In this sense, the current COVID-19 situation is a danger to market opportunities in the short run.
4	Economic freedom	Panama and Chile score the highest, Argentina and Ecuador the lowest.
5	Corruption 2019	Chile has the least corruption, Mexico the most.
6	Education	Dutch exporters will most likely want to partner with local companies in the destination countries. A well-educated population is an advantage. Argentina, Chile, Costa Rica and Panama score the highest in this respect.
7	% of MSW collected	All countries collect between 80%-100% of Municipal Solid Waste, except Mexico and Panama with scores of 60%-80%. The more MSW collected, the more volume is available for processing.
8	% of waste recycled	All countries are in the 5%-15% range, except Panama and Peru with 0%-5%. This is a clear indication of the stage the countries are in: recycling is still largely dominated by the informal sector. The good news is that there is enormous scope for improvement.
9	% of municipal waste to landfills	In Argentina, Colombia and Mexico between 80%-100% of municipal waste ends up in landfills. In Ecuador, Panama and Peru it is 40%-60%, but this is not necessarily good news as a lot tends to leak out of the system through illegal dumping, burning etc. In any case, the importance of landfilling as a final destination of waste in the target countries is abundantly clear.

10	Waste policy framework and enforcement	Chile and Colombia are the frontrunners, Panama is lagging behind. Enforcement of the rules is still weak in all countries.
11	EPR systems	Chile and Colombia are the frontrunners. Argentina, Mexico and Panama are the slow-pacers. Chile and Colombia will need the infrastructure in terms of efficient waste logistics, transfer stations, sorting and recycling systems to make the EPR systems work. This will generate additional opportunities for Dutch exporters.
12	Grid connected Waste-to-Energy	Waste-to-Energy needs scale, so it is not surprising that this is not taking off in Costa Rica, Ecuador and Panama. In the other countries, developments in large scale WtE have not moved beyond studies yet.
13	Financing the system	Although the ways to finance the waste management system are very different, Colombia and Costa Rica are considered frontrunners. Colombia has an intricate system to determine municipal waste fees and has recently introduced a (small) landfill tax. In Costa Rica, the project team found that in some regions the waste system is actually well financed. In most of the other countries, waste management is financed through non-specific budgets, so the citizens have no incentive to reduce waste outputs.
14	Information management	Good information management is a solid foundation for a well-functioning waste/CE sector. For Dutch exporters, it is a compass they use to determine where to focus their efforts. Chile, Colombia and Peru score highest in this respect, but there is still ample scope for improvement in all countries.
15	Balanced roles of all actors in waste/CE	Chile, Costa Rica and Ecuador score highest. The general picture is: the more developed the different players in the waste/CE sector are and the more they cooperate, the better the opportunities for Dutch waste/CE exporters.
16	Public awareness	In Chile and Colombia, public awareness is considered most developed. This can be a driver for better waste/CE management and therefore additional business opportunities.
17	Private sector suppliers	Chile is the most developed, followed by Colombia. In these countries Dutch companies are likely to find professional partners to do business with or to set up joint projects.
18	Circular economy	Colombia and Chile are leading the pack, but it should be noted that the circular economy is still very much understood in the context of sustainable waste management.

IV. Recommendations

Below is a set of recommendations by the project team. Most recommendations refer to specific conclusions mentioned under I. General conclusions.

1. (re conclusion 1) It is argued that the waste/CE sector in the countries studied is mostly in the control and technical fix phase. In each country, it is recommended to focus efforts in the first place on the establishment of a **solid backbone of a well-functioning and financially independent waste management system**. This includes good coverage of waste collection services, efficient waste logistics, recycling to the extent possible and sustainable landfilling. Good governance and solid financing of the system are essential too. Exotic waste processing techniques without a track record elsewhere should be avoided. The long-term experience of Dutch consultancy firms can play a key role in the design of such waste management systems.
2. (re conclusion 2) The waste/CE sector is a strongly policy-driven sector. This is why more than in other sectors, a **combined private – public sector approach** in exports promotion is essential. The Partners for International Business program on waste and water in Colombia in 2014-2016 is evidence of this. Dutch experts have been instrumental in designing recycling and EPR policies in Colombia. It is recommended to aim for a similar approach in the other countries as a follow-up to this study.
3. (re conclusion 3) In follow-up activities, it is recommended to duly take into account the position of the waste pickers. The goal should be a **professionalization of the waste sector including a perspective for all formal waste pickers**. Some will be interested to professionalize and become employees or even entrepreneurs in a professional waste company. Others will benefit more from social programs. The [Association of Dutch Municipalities](#) (VNG) together with the municipality of Pereira in Colombia show how the formal waste picker can play a central role in the collection of recyclable materials and this way build a social and environmentally sustainable sector.
4. (re conclusion 4) **Waste dump sites** are a common problem in all the target countries. Any action to ameliorate this situation (e.g., a guide for sustainable landfill management, a pilot project of turning a waste dump into a sanitary landfill carried out by a consortium of Dutch and local companies, or a successful example of closing down local waste dumps and creating a regional sanitary landfill) would be highly recommendable in Latin America. Dutch private companies can play an important role here in transferring knowledge and technology on sustainable landfilling. Regionalization of waste services will require a lot of knowledge and experience that Dutch public institutions can offer.
5. (re conclusion 5) In all target countries **organic waste makes up around 50%-60% of domestic waste**. Industrial organic waste is a problem because of its volume and odor. As a result, **the treatment of industrial and domestic organic waste** is identified as an important business opportunity. It is recommended to support private / public initiatives to develop profitable business models to process this waste for the specific case of Latin America.
6. (re conclusion 6) The same holds for **Construction and Demolition waste**. It is a growing problem in all target countries, so a profitable treatment solution in one of the countries would be highly replicable in the others.
7. (re conclusion 7) Chile and Colombia are the frontrunners in **EPR systems**. These systems are of vital importance for increasing the volume of collected plastics. As a result, business opportunities are expected in **plastics recycling in Chile and Colombia**. The World Bank, International Development Banks and the European Union have financial resources for the implementation of (single use) plastics projects. In other countries, Dutch consultants can play an important role in the design of EPR systems or in the introduction of the necessary infrastructure by offering recycling equipment.
8. (re conclusion 8) For waste streams that are smaller in volume (such as **e-waste, mattresses and pharmaceutical/hospital waste**) it is recommended to carry out follow-up research to see whether waste flows can be combined on a trans-national scale (as is the case in Europe with e.g., batteries and e-waste) to achieve economies of

scale. A first check should be whether transboundary transport of waste is permitted. Consultants can help to build a foundation upon which waste management can scale.

9. (re conclusion 9) One of the key success factors of the Dutch waste management sector is the system of **full cost coverage**: municipalities are allowed to levy a municipal waste tax which covers the costs of the waste service, but they are not allowed to make a profit on it. The environmental targets are set by the central government (and the EU), whereas the service level is determined by the municipal council (within reasonable boundaries). Such a system would be a giant leap forward for the countries of Latin America. In order to test the approach, it is recommended to evaluate what such a system would entail in terms of waste tariffs in a set of typical communities (e.g., a small village, a medium size city and a metropolis). Local systems such as the utility tariffs stratification applied in Colombia could be very helpful in designing a system of full cost coverage that would work in Latin America.

10. (re conclusion 10) The Netherlands has a lot to offer in all aspects of **waste data management**, both from a public and a private sector point of view. An integrated (pilot) program in one of the smaller countries could show the power of reliable data as a foundation for sound waste management. Costa Rica or Ecuador could be good candidates for such a program, as various stakeholders have mentioned a lack of data as a barrier for progress there. Cooperation can be established with the European Union to look for financial support.

11. (re conclusion 11) Specific activities may be set up to **increase awareness on the importance of sustainable waste management**. There is a unique momentum, certainly in the light of the recent COVID-19 lockdown, that has created awareness for sustainability and a healthy environment in general. Dutch participation in national seminars can be a good way to establish a first momentum with public and private organizations to share the overall Dutch vision on sustainable waste management. In follow-up activities, Dutch private companies are advised to team up with local players in order to craft awareness building programs tailored to the local needs and culture. Financing of these activities will probably have to come from multilateral or bilateral support agencies.

12. (re conclusion 12) The concept of a **circular economy** is a field wide open in the countries studied. The Netherlands has developed its CE strategy, an increasing number of private sector companies is developing new business concepts and the Holland Circular Hotspot (HCH) is actively disseminating the CE message worldwide. Circular economy attracts especially a new generation of entrepreneurs, so activities in this field mean an investment in the future in more than one sense. Waste management can be a catalyst to more circular activities. It is recommended to help the target countries in developing their own CE strategy, to make an inventory of CE activities which are already undertaken in the countries and to support young entrepreneurs in the field, e.g., through incubator programs (such as Orange Corners). If the concept catches on, regional or local CE hubs could be established. In most countries, multilateral organizations (such as the World Bank and the European Union) are supporting activities to help national governments with the design of their circular economy strategy.

13. (general) The embassies have taken a unique step in contracting a joint market evaluation in waste and circular economy in eight countries spanning all of Latin America. **The most important recommendation of the project team is to hold on to this cooperation and plan and execute follow-up activities jointly, albeit in a flexible manner.** As indicated above, the similarities between waste/CE sectors of the eight countries strongly outweigh their differences. The fact that Spanish is spoken in all the countries is a big advantage. Pilot projects in one country will be highly replicable in others. Partners for International Business programs could be organized on a regional scale (depending on demand). The Netherlands could position itself as the country of choice when it comes to waste/CE expertise on a continental scale by grouping key waste/CE representatives of all eight countries and take them on a Dutch visitors' program to the Netherlands. Likewise, we could facilitate and feed inter-country knowledge exchange in Latin America itself. The feasibility of this will depend on the interest on the part of the Dutch suppliers of products and services, but earlier experiences in e.g., Colombia have shown that they are keen to participate in such programs.

V. How to do Business in Latin America in the Waste Management sector

The current population of Latin America and the Caribbean is about 650 million^{ccxiv}, equivalent to 8.42% of the total world population. Latin America is a continent double the size of Europe. Therefore, even regional differences can be so pronounced that it is almost as if you are dealing with a country within a country. 82.5 % of the population is urban, the median age in Latin America and the Caribbean is 31 years^{ccxv}.

1. Speak Spanish

Spanish is the main language of Latin America and English is little spoken. That is why it is important to learn the language (it is also a respectful gesture) or have somebody accompany you at your meetings who speaks Spanish. We advise you to have your presentations prepared in Spanish, so people can easily follow the discussions.

2. Immerse yourself in the Latin American (business) culture

The Latin culture can be very different from our Dutch culture. People are interested in your family and hobbies and want to get to know more about you before doing business. Therefore, accept social invitations, connecting with people outside of work is important for business. It is also recommended to participate at congresses and fairs organized by trade organizations, government and private organizations to get to know the current situation of the sector and easily meet potential clients.

While Latin Americans are happy to help you and will receive you with a lot of enthusiasm to discuss your company or project, often it is difficult to stay in contact after a visit. People do not take the time to respond to emails. It is more common to use WhatsApp to contact somebody, even for business communication.

Be prepared to be very flexible with time keeping. The Dutch are very particular when it comes to the time a meeting starts. For Latins, it is more important that a meeting ends when the time is right – meaning they may be late for the next meeting!

Unfortunately, corruption is a serious problem in Latin America. It is common to do a quick check on a company, before starting official negotiations.

3. Be prepared to invest time (and money)

The pace of life in Latin America is very different to the Netherlands. The pace varies from country to country, but you will have to be willing to pay at least several visits before starting projects in Latin America. It often takes a long time, up to multiple years to initiate a project. People normally ask for a local reference project, since they want to “touch and see” the product in their local conditions, before proceeding with any purchase.

4. Way of communication

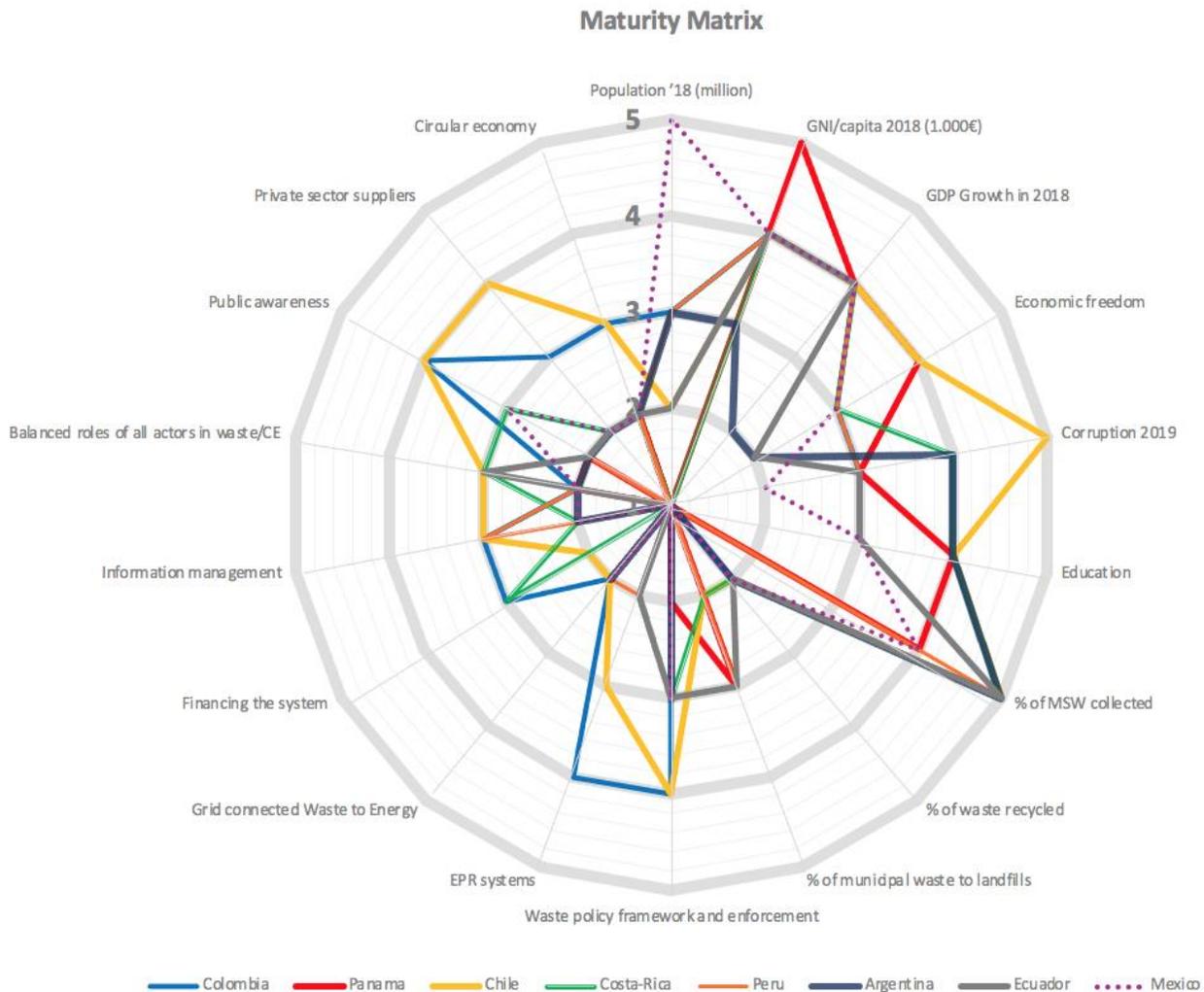
In the Netherlands we are used to having discussions. Latins tend to be less confrontational. So be aware of how you communicate and how people communicate with you. Define concrete follow-up actions before ending a meeting. In private and public organizations hierarchy is important. Be aware of the different roles of the persons within a team/organizations and address people with “señor” or “señora”.

Latin American professionals tend to be highly educated. They may have attended university in the United States, and have a daughter or son living in the Netherlands. Keep this into account when entering the Latin American business market. Your counterparts normally do a profound study of the product/service they are looking for.

As mentioned before, Latin America is a huge continent with lots of different cultures and ways of doing business. Therefore, we suggest having a look at the country specific pages of [RVO](#) or the [World Bank](#).

ANNEXES

ANNEX I – Framework - Maturity Matrix Waste Management and Circular Economy



In the framework of the Market Study Waste/CE in eight countries in Latin America a so called “Maturity Matrix for Waste and Circular Economy” was developed. (Sep – Dec 2020)

Realizing that the waste management and circular economy sector contain a lot of different markets, the key question the Maturity Matrix aims to address is: Is this a potential target market for me as a Dutch exporter of goods and/or services in waste/CE? Since some of the scores can be positive for one exporter, but negative for another exporter, we do not draw conclusions in this part of the report. Specific conclusions on business opportunities can be found in the countries 5-pagers.

Important:

- The Maturity Matrix has no scientific ambitions
- There are general indicators and indicators specifically related to waste and/or circular economy
- There are quantitative and qualitative indicators

- For reasons of simplicity, the number of indicators is limited. The focus is on indicators which can be evaluated relatively easily
- There is a clear distinction between the different scores (also for qualitative indicators). The downside of this is a relatively low-resolution photo of the waste/CE sector
- The scoring categories have been designed in a way that the Netherlands does not consistently score 100%
- When applying the matrix, it is essential to mention when the maturity matrix was scored and for which geographical region it applies
- The Maturity Matrix Score can be depicted as a radar chart (see example above) or as a linear graph

Maturity Matrix Indicators and Scores

Acronyms:

AD = Anaerobic Digestion

MSW = Municipal Solid Waste

SWM = Solid Waste Management

Note: The indicators and the scores are explained below the table. Indicators are listed in random order.

#	Indicator	1	2	3	4	5
GENERAL INDICATORS						
1	Population '18 (million)	<5 m	5-20 m	20-50 m	50-100 m	>100 m
2	GNI/capita 2018 (1.000€)	<1	1-4	4-10	10-25	>25
3	GDP Growth in 2018	<-5%	-5%-0%	0%	0%-5%	>5%
4	Economic freedom	Repressed	Mostly unfree	Moderately free	Mostly free	Free
5	Corruption 2019	>145	109-144	73-108	37-72	>37
6	Education	>145	109-144	73-108	37-72	>37
QUANTITATIVE WASTE/CE INDICATORS						
7	% of MSW collected	0%-20%	20%-40%	40%-60%	60%-80%	80%-100%
8	% of waste recycled	0%-5%	5%-15%	15%-30%	30%-75%	75%-100%
9	% of waste to landfills	80%-100%	60%-80%	40%-60%	20%-40%	0%-20%
QUALITATIVE WASTE/CE INDICATORS						

10	Waste policy framework and enforcement	Not started	First attempt	Under way	Well developed	Completely in place
11	EPR systems	Not applied	Under development	Voluntary systems	Move to mandatory	Fully applied
12	Grid connected Waste to Energy	Not applied	First studies	Pilot project	Industrial scale	Well established
13	Financing the system	Citizen pays collection	Collection + tipping fee	Waste tax insufficient	Waste tax additional	Full cost coverage
14	Information management	No data collected	Some data collection	Data collection	Some data management	Mandatory data management
15	Balanced roles of all actors in waste/CE	No cooperation	Some cooperation	Positive attitude	Cooperation	Full balance
16	Public awareness	None	First signs	Pressure groups	Pressure + action	Part of the culture
17	Private sector suppliers	Non specific	Some specific	Not organized	Organized incomplete	Full coverage
18	Circular economy	No CE awareness	CE strategy	Strategy + 1 st action	Decoupling	Fully circular

Explanation per indicator (on a national scale, but can be applied on another scale as well):

#	Explanation
GENERAL INDICATORS	
1	Population figures in 2018 according to the World Bank
2	Based on World Bank figures and indicators
3	According to World Bank figures
4	According to the 2020 ranking of the Heritage Foundation
5	Ranking ranges according to the Corruption Perception Index of Transparency International 2019
6	Ranking ranges according to the Education Index of the United Nations Development Program
QUANTITATIVE WASTE/CE INDICATORS	
7	MSW = Municipal Solid Waste
8	“Recycling” refers to all activities where products or materials are processed and re-introduced into the value chain (it includes product refurbishment and reuse). In the context of this maturity model, it does not include recovered energy from waste
9	“Landfilled” can mean anything from open dumps to controlled landfills. Note that there are better options than landfilling such as reuse and recycling, but also worse options such as illegal dumping and burning of the waste. The score in this category should be interpreted in the context of the other indicators.

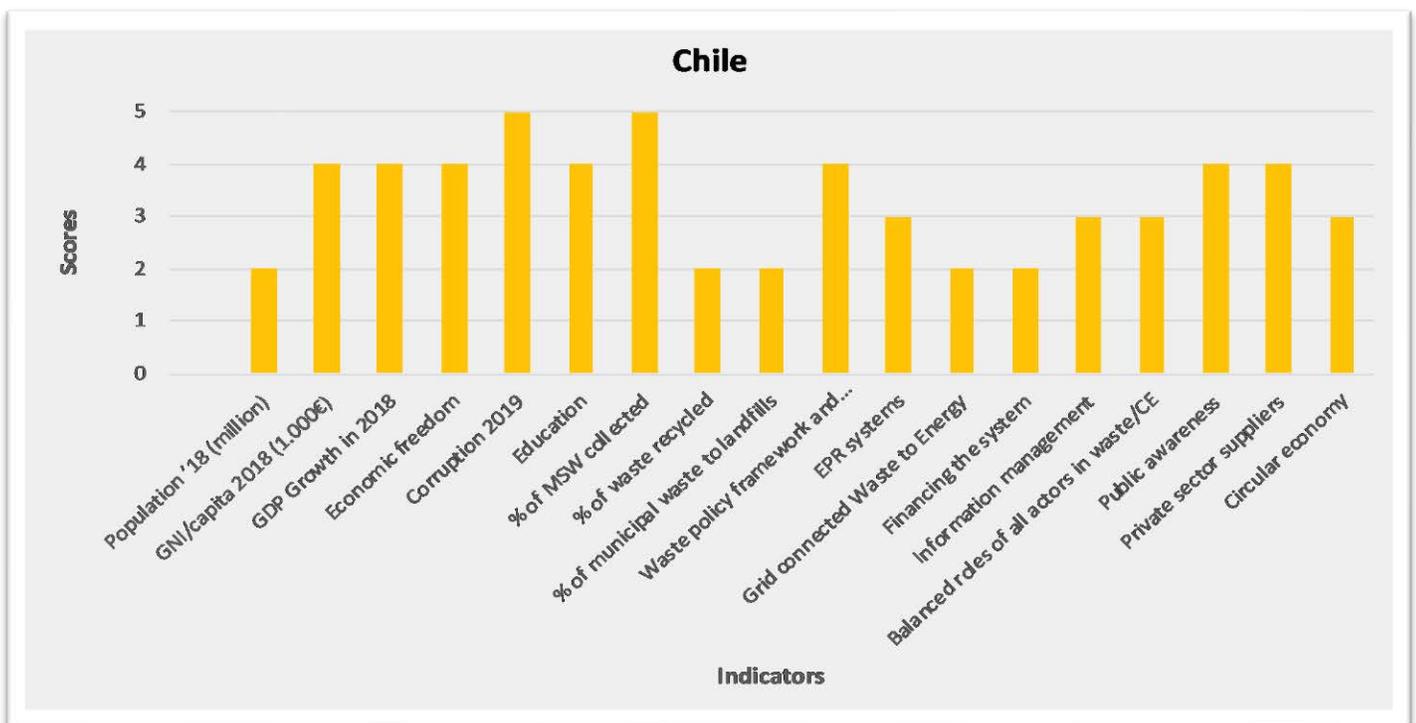
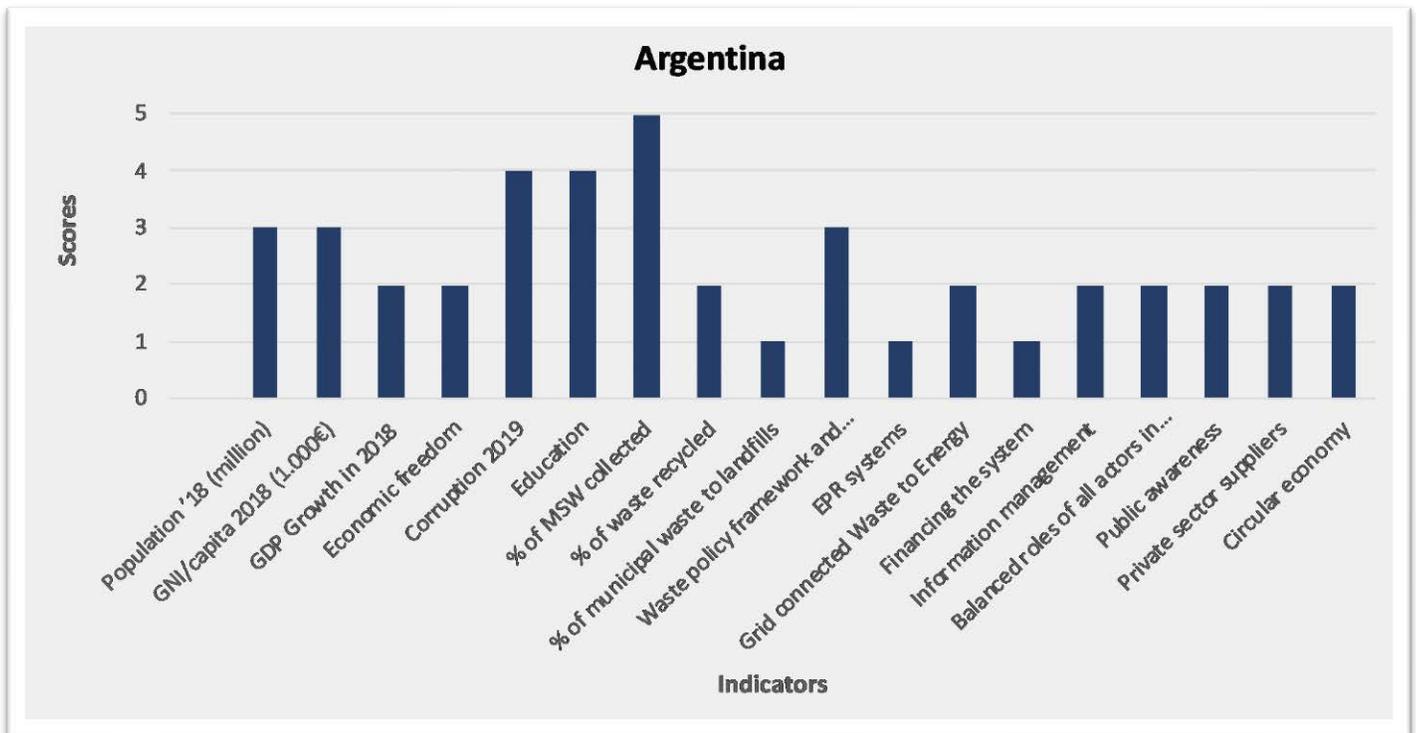
QUALITATIVE WASTE/CE INDICATORS	
10	<p><u>Low</u>: There is no overall view on waste management, no National SWM Plan, no national action plans, no SWM plans on provincial / regional / municipal levels</p> <p><u>Low-medium</u>: First attempts are underway to develop a National SWM Plan</p> <p><u>Medium</u>: There is an overall view on waste management and a National SWM plan but no regularly updated action plans nor SWM Plans at lower levels, enforcement of rules is weak</p> <p><u>Medium – High</u>: There is a National SWM Plan as well as waste management plans at lower levels but no periodically updated action plans, some enforcement of rules</p> <p><u>High</u>: There is an overall view on waste management, a National SWM Plan, National targets, periodic national action plans, plus regularly updated SWM plans on provincial / regional / municipal levels, rules are being enforced</p>
11	<p><u>Low</u>: Extended Producer Responsibility systems are not on the agenda</p> <p><u>Low-medium</u>: EPR systems for some waste streams are being developed</p> <p><u>Medium</u>: Voluntary EPR system for at least one waste stream is up and running</p> <p><u>Medium – High</u>: Mandatory EPR system for at least one waste stream is operational</p> <p><u>High</u>: Mandatory EPR systems for at least three waste streams are operational (e.g. packaging materials, batteries, EEE, End of Life vehicles, tires, glass)</p>
12	<p><u>Low</u>: Grid connected Waste-to-Energy is not being considered (there may be off-grid applications, e.g. electricity generation for private use through incineration or anaerobic digestion (AD) of residual biomass). The legal, financial and infrastructure conditions for grid connected WtE are not in place</p> <p><u>Low-medium</u>: Studies are being carried out to assess the necessary legal, financial and infrastructure conditions for grid connected WtE</p> <p><u>Medium</u>: The legal, financial and infrastructure conditions for grid connected WtE are in place. Pilot project(s) in waste incineration and/or AD are being developed</p> <p><u>Medium – High</u>: The first industrial scale WtE project (e.g. mass incineration or AD) is functioning satisfactorily from a technical, environmental, financial, community acceptance and waste-diversion-from-landfill point of view</p> <p><u>High</u>: Grid connected Waste-to-Energy has developed into a fully developed component of the waste management system. At least 10% of the waste output is incinerated</p>
13	<p><u>Low</u>: The citizen pays upon collection (in practice: to the collector). The rest of the chain is paid out of general federal and municipal budget. The overall chain is underfinanced.</p> <p><u>Low-medium</u>: The citizen pays upon collection; the collector pays the tipping fee at the landfill. The overall chain is still underfinanced, but to a lesser extent.</p> <p><u>Medium</u>: The citizen pays a waste management or a general tax (municipal or federal), although it is insufficient to cover the costs. Additional funding is necessary to finance parts of the waste management system (especially further downstream)</p> <p><u>Medium – High</u>: The citizen pays a waste management or general tax which roughly covers the OPEX and CAPEX costs of the system. Additional funding is still necessary.</p> <p><u>High</u>: The citizen pays a waste management tax covering all OPEX and CAPEX costs on a full cost coverage basis. Financial instruments (such as taxes on landfilling and waste incineration as well as Pay as You Throw systems) are applied to promote waste processing options higher in the waste hierarchy.</p>
14	<p><u>Low</u>: No data collected on a regular and uniform basis</p> <p><u>Low-medium</u>: Some data collected on a regular and uniform basis, no data management, no reporting, no feedback</p> <p><u>Medium</u>: Waste management data is collected on a regular basis and in a uniform way, little data management, little reporting, no feedback loops</p> <p><u>Medium – High</u>: Reliable waste management data is collected and validated on a regular basis and in a uniform way, some data analysis and reporting and feedback on key indicators</p> <p><u>High</u>: A comprehensive set of validated and reliable waste management data has to be supplied to the federal authorities on a regular basis, benchmark analysis is performed, regular reporting, feedback to actors in the waste chain</p>

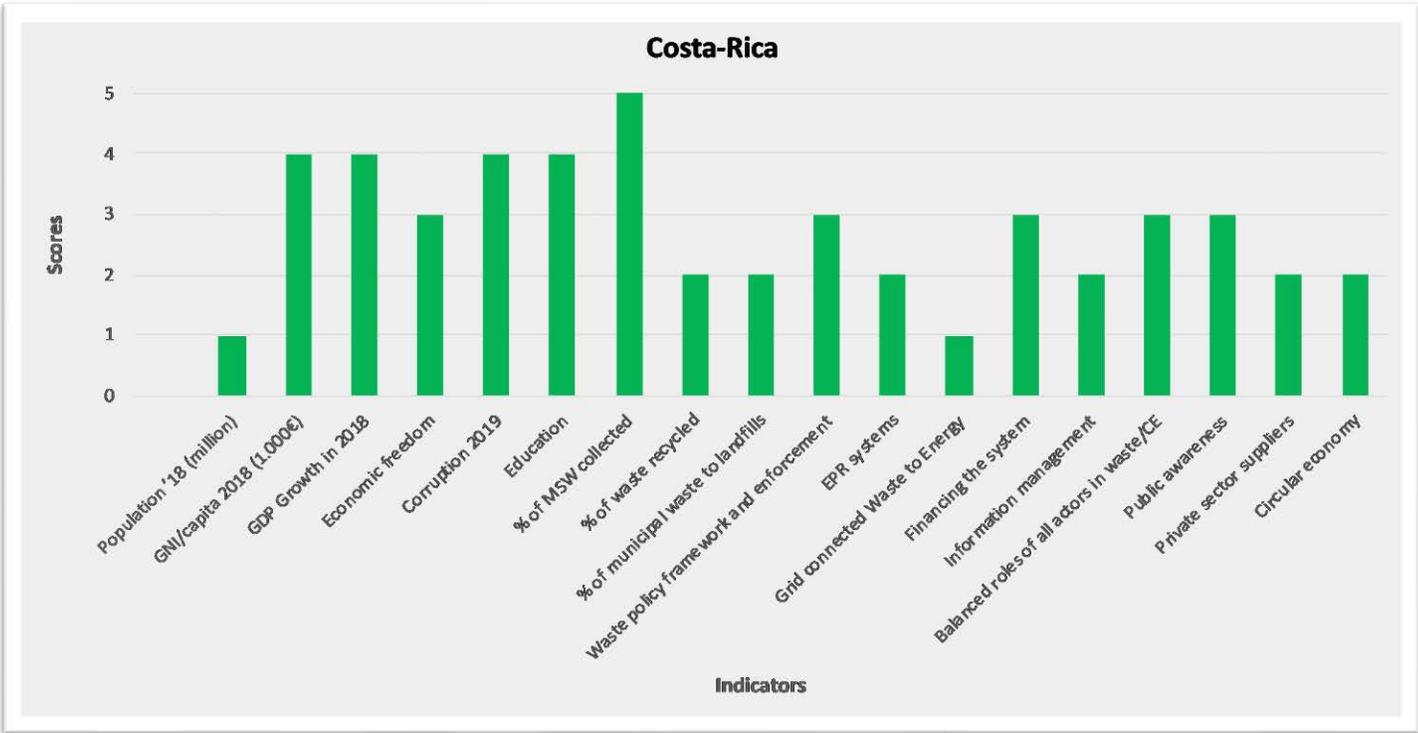
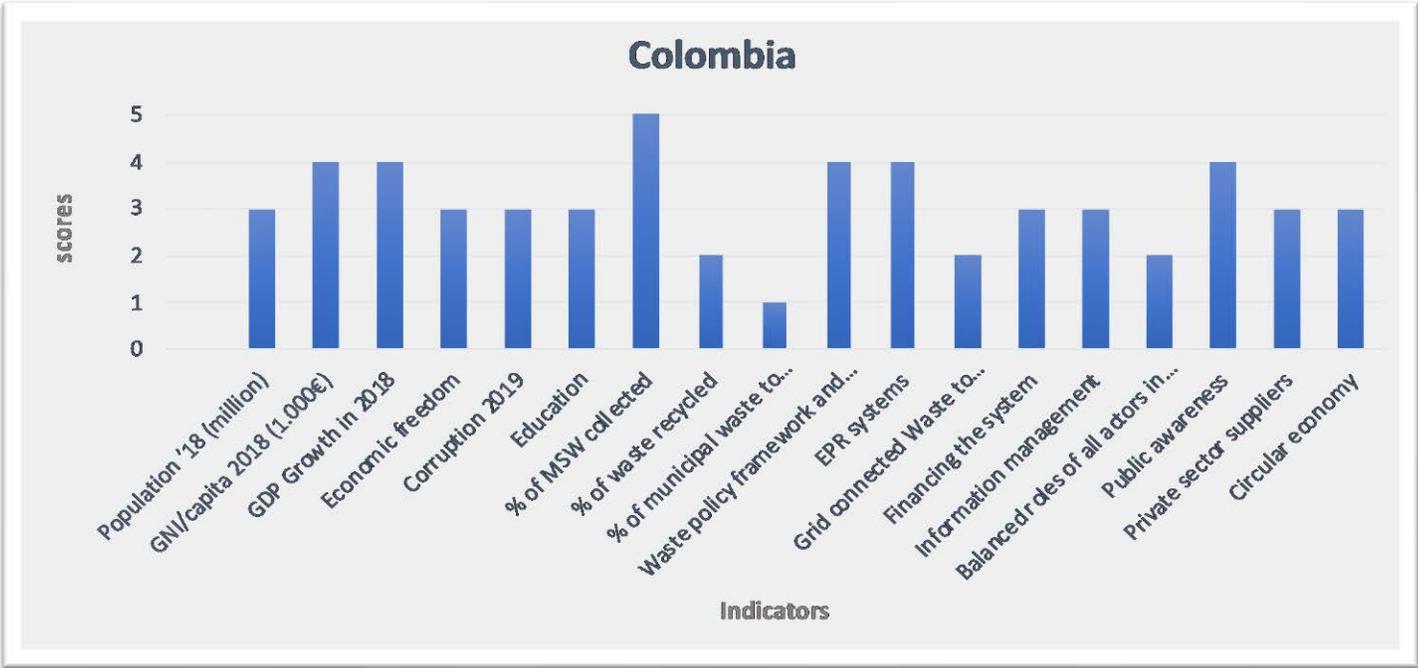
15	<p><u>Low</u>: Weak public and/or private players, little cooperation between actors in the sector, different levels of professionalism, (possibly) dominance of the public or the private sector, little interaction with academic and financial institutions</p> <p><u>Low-medium</u>: Some cooperation between actors in the sector (e.g. private sector entities are hired by the public authorities), professionalization of informal sector set in motion</p> <p><u>Medium</u>: Positive attitude towards cooperation in the sector but no involvement of other actors in public sector policy making, general consensus of the way in which the waste/CE sector should develop</p> <p><u>Medium – High</u>: Strong public and private players, broad consensus on the way the waste/CE sector should develop, good cooperation between the public and the private sector</p> <p><u>High</u>: Strong public and private players, full balance and intense cooperation between the public and private sector, academic and financial institutions etc., consultation of other actors in the sector on public policy making</p>
16	<p><u>Low</u>: No signs of public awareness, widespread littering</p> <p><u>Low-medium</u>: Front runners begin to air their concerns about waste situation and the need for a clean environment</p> <p><u>Medium</u>: Public pressure groups are formed, first public actions to clean up the environment, general public is becoming aware that waste can be harmful</p> <p><u>Medium – High</u>: Pressure groups have become mainstream, littering is actively discouraged, events such as World Environment Day are observed, citizens are beginning to separate their waste</p> <p><u>High</u>: Waste separation has become part of the culture, littering is considered bad behavior, awareness is growing that waste materials are actually resources</p>
17	<p><u>Low</u>: There are no suppliers of products and/or services specifically for the waste/CE industry in the country (there may be more general suppliers such as truck dealers and project developers)</p> <p><u>Low-medium</u>: Some suppliers specifically catering to the waste/CE sector can be identified, their products and services can still be basic</p> <p><u>Medium</u>: A non-organized sector of suppliers of products and services to the waste/CE sector had been established</p> <p><u>Medium – High</u>: There is a well-organized sector of suppliers to the waste/CE sector, but their joint portfolio of products and services is not complete</p> <p><u>High</u>: There is a well-organized sector of suppliers to the waste/CE sector, their joint portfolio of products and services is (almost) complete and high end</p>
18	<p><u>Low</u>: Although some circular R-strategies may be applied (and may have been for ages, such as reuse and refurbishment), the concept of circular economy is unknown and in fact not understood</p> <p><u>Low-medium</u>: The concept of circular economy has been introduced and a circular economy strategy has been developed</p> <p><u>Medium</u>: The first projects and system changes to promote the circular economy have been implemented successfully or are in the process of development</p> <p><u>Medium – High</u>: A measurable decoupling between economic growth and resource use has been achieved as a tangible result of circular economy measures</p> <p><u>High</u>: (Almost) full circularity has been achieved, in a sense that (almost) all resources are kept within the production – consumption value chain</p>

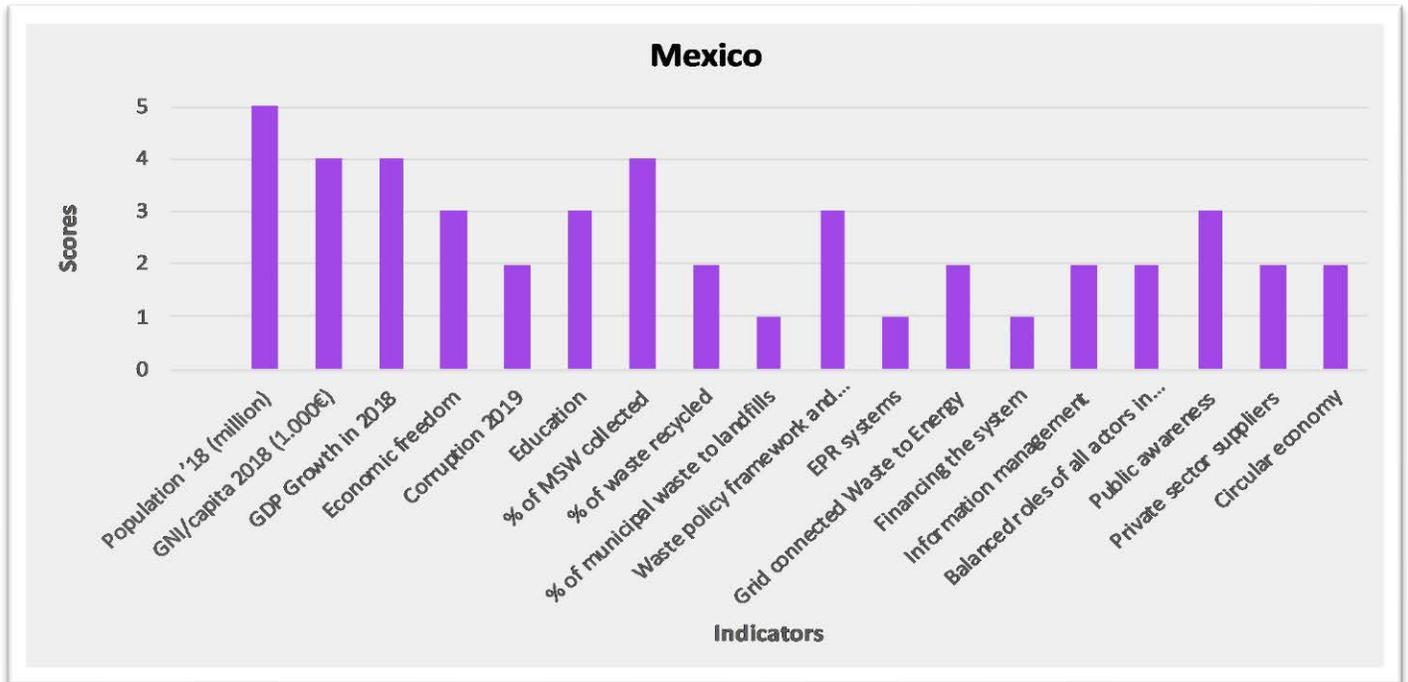
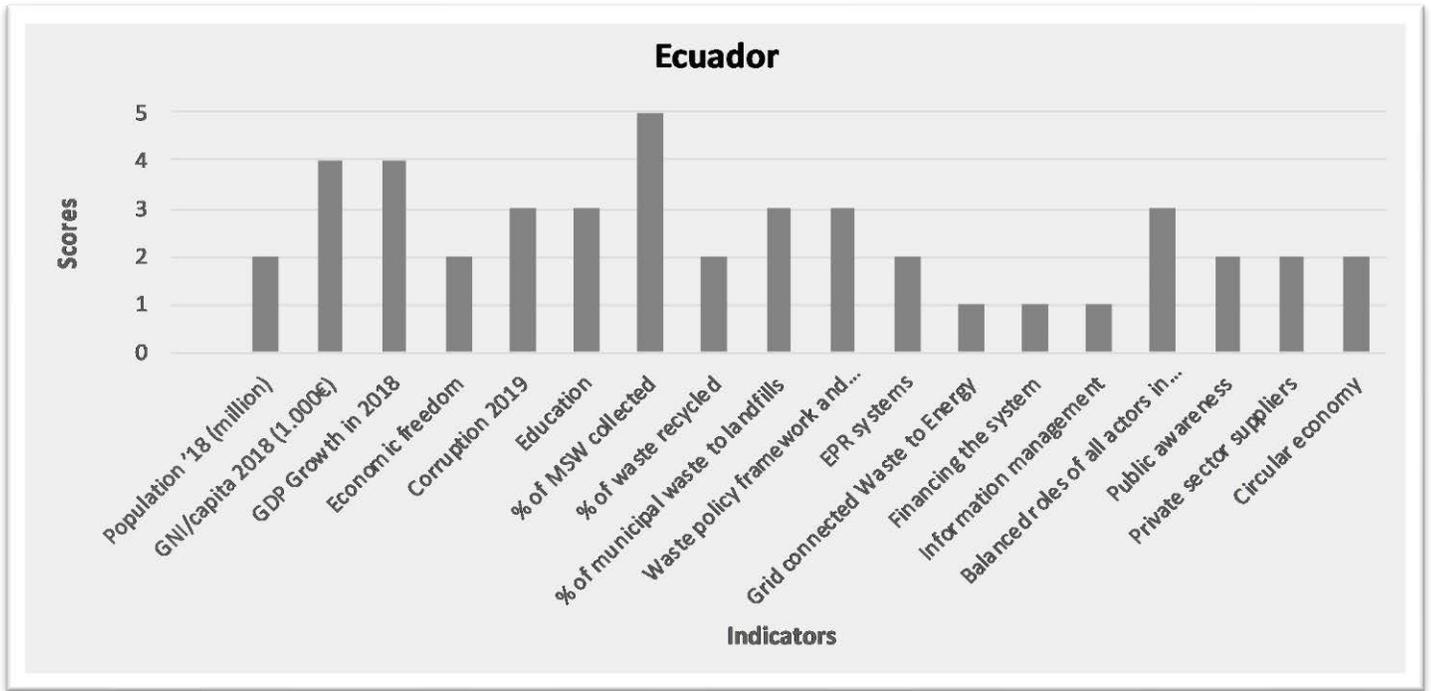
ANNEX II – Results Maturity Matrix Waste Management and Circular Economy

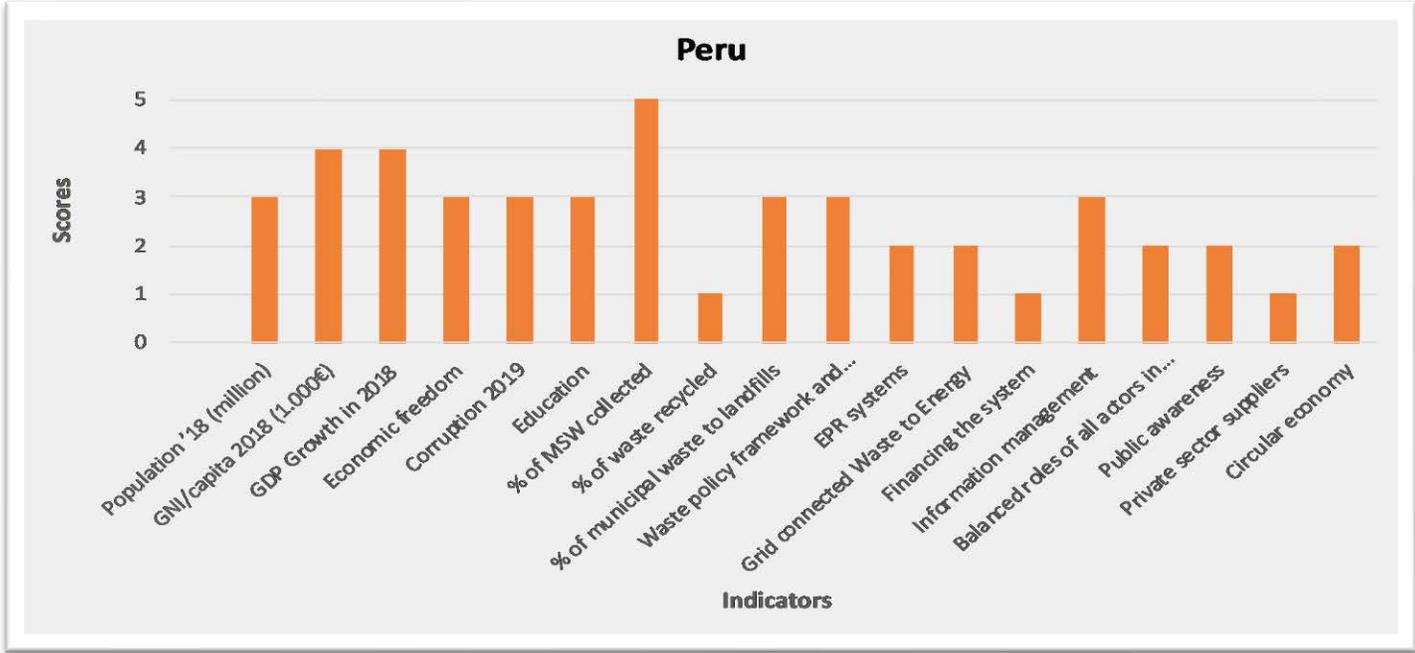
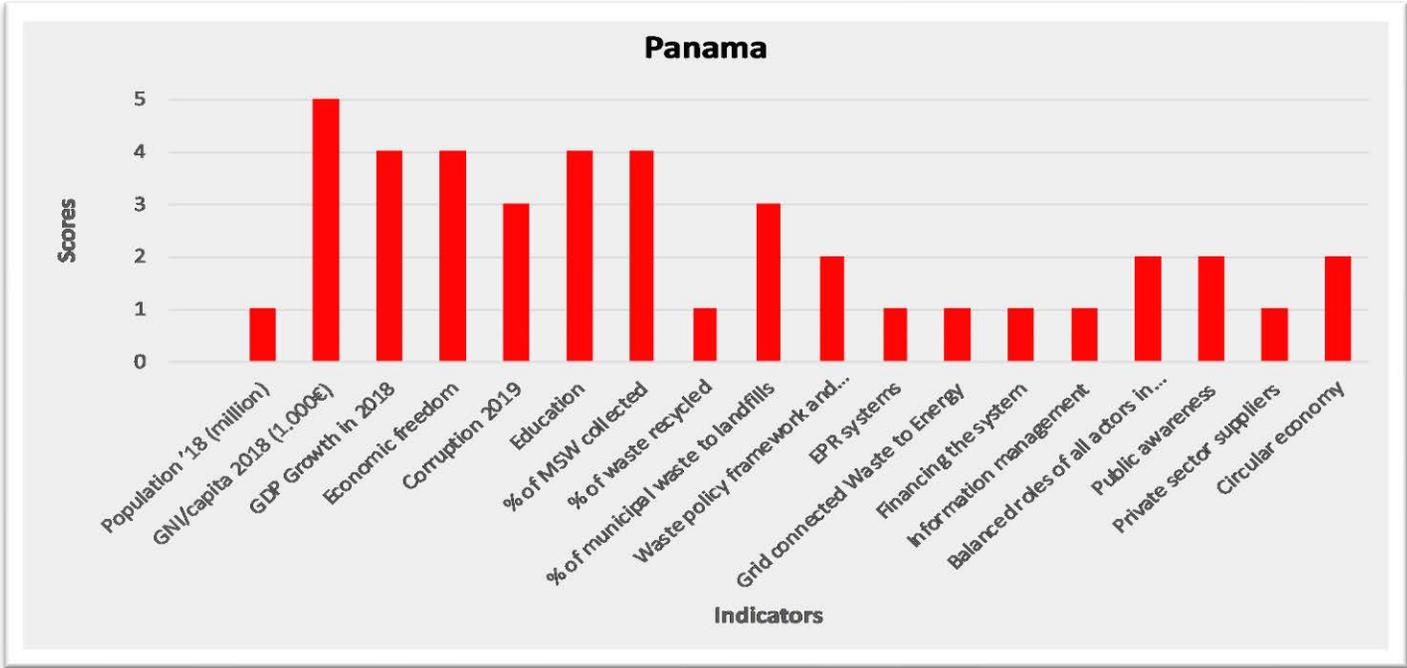
		Colombia	Panama	Chile	Costa-Rica	Peru	Argentina	Ecuador	Mexico
1	Population '18 (million)	3	1	2	1	3	3	2	5
2	GNI/capita 2018 (1.000€)	4	5	4	4	4	3	4	4
3	GDP Growth in 2018	4	4	4	4	4	2	4	4
4	Economic freedom	3	4	4	3	3	2	2	3
5	Corruption 2019	3	3	5	4	3	4	3	2
6	Education	3	4	4	4	3	4	3	3
7	% of MSW collected	5	4	5	5	5	5	5	4
8	% of waste recycled	2	1	2	2	1	2	2	2
9	% of municipal waste to landfills	1	3	2	2	3	1	3	1
10	Waste policy framework and enforcement	4	2	4	3	3	3	3	3
11	EPR systems	4	1	3	2	2	1	2	1
12	Grid connected Waste to Energy	2	1	2	1	2	2	1	2
13	Financing the system	3	1	2	3	1	1	1	1
14	Information management	3	1	3	2	3	2	1	2
15	Balanced roles of all actors in waste/CE	2	2	3	3	2	2	3	2
16	Public awareness	4	2	4	3	2	2	2	3
17	Private sector suppliers	3	1	4	2	1	2	2	2
18	Circular economy	3	2	3	2	2	2	2	2
		Colombia	Panama	Chile	Costa-Rica	Peru	Argentina	Ecuador	Mexico

ANNEX III–Graphic representation of the Maturity Matrix for Waste and Circular Economy per Country









ANNEX III - Important contact information

Argentina

Netherlands Embassy in Buenos Aires

Address: Puerto Madero, Edificio Porteño II. Olga Cossettini 831, Piso 3 C1107CDC Buenos Aires

Telephone number: (+54) 11-43380050

Email: bue-ea@minbuza.nl

Website: <https://www.nederlandwereldwijd.nl/landen/argentinie/over-ons/ambassade-in-buenos-aires>

Agricultural Counsellor in Buenos Aires

Address: Puerto Madero, Edificio Porteño II. Olga Cossentini 831, Piso 3, C1107 BVA Buenos Aires, Argentinië

Telephone number: +54 11 4338 0090

E-mail: bue-lnv@minbuza.nl

Website: <https://www.agroberichtenbuitenland.nl/landeninformatie/argentinie/landbouwraad>

Chile

Netherlands Embassy in Santiago

Address: Chile Apoquindo 3500, 13th floor Las Condes Santiago Chile

Telephone number: (+56) 2 2756 9200

Email: stg-ea@minbuza.nl

Website: <https://www.nederlandwereldwijd.nl/landen/chili/over-ons>

Agricultural Counsellor (part of Agricultural Counsellor of Argentina)

Address: Puerto Madero, Edificio Porteño II. Olga Cossentini 831, Piso 3, C1107 BVA Buenos Aires, Argentinië

Telephone number: +54 11 4338 0090

E-mail: bue-lnv@minbuza.nl

Website: <https://www.agroberichtenbuitenland.nl/landeninformatie/chili/landbouwraad>

Holland House Chile

Address: Merced 230, Región Metropolitana Santiago

Telephone number: (+56) 9 5221 4822

Email: info@hollandhouse.cl

Website: <https://hollandhouse.cl/>

Colombia

Netherlands Embassy in Bogotá

Address: Carrera 13 No. 93-40, Piso 5, Bogotá

Telephone number: +5716384200

Email: bog-ea@minbuza.nl

Website: <https://www.nederlandwereldwijd.nl/landen/colombia/over-ons/ambassade-in-bogota>

Agricultural Counsellor in Bogotá

Address: Carrera 13 No. 93-40, Piso 5, Bogotá

Telephone number: +57 (1) 638 42 22

Email: bog-lnv@minbuza.nl

Website: <https://www.agroberichtenbuitenland.nl/landeninformatie/colombia/landbouwraad>

Holland House Colombia

Address: Calle 90 No 19 – 41 Oficina 801 Edificio Quantum, Bogotá.

Telephone number: (571) 744 95 66

Email: gerencia@hollandhouse-colombia.com

Website: <https://hollandhouse-colombia.com/>

Costa Rica

Netherlands Embassy in San José

Address: Oficentro La Sabana, Gebouw 3, 3e verdieping, La Sabana Sur, San José

Telephone number: +50622961490

Email: sjo-ea@minbuza.nl

Website: <https://www.nederlandwereldwijd.nl/landen/costa-rica/over-ons/ambassade-in-san-jose>

Holland House Costa Rica

Address: San José, San José Costa Rica

Telephone number: +506 8458 9947

Email: info@hollandhouse.cr

Website: <https://www.hollandhouse.cr/>

Ecuador

Consulate Ecuador is part of the **Netherlands Embassy of Peru**

Address: Torre Parque Mar, Av. José Larco 1301, 13e verdieping Miraflores - Lima

Telephone number: +51 1 213 9800

Email: lim-ea@minbuza.nl

Website: <https://www.nederlandwereldwijd.nl/landen/peru/over-ons/ambassade-in-lima>

Agricultural Counsellor (part of agricultural counsellor in Bogotá)

Address: Carrera 13 No. 93-40, Piso 5, Bogotá

Telephone number: +57 (1) 638 42 22

Email: bog-lnv@minbuza.nl

Website: <https://www.agroberichtenbuitenland.nl/landeninformatie/colombia/landbouwraad>

México

Netherlands Embassy in Mexico City

Address: Volcán 150, piso 2, Edificio Qúbica, Col. Lomas de Chapultepec, C.P. 11000, Mexico-Stad

Telephone number: +525511056550

Email: mex-info@minbuza.nl

Website: <https://www.nederlandwereldwijd.nl/landen/mexico/over-ons/ambassade-in-mexico>

Agricultural Counsellor in Mexico

Address: Volcán 150, piso 2, Edificio Qúbica, Col. Lomas de Chapultepec, C.P. 11000, Mexico-City

Telephone number: +52 55 11 05 65 60

Email: mex-lnv@minbuza.nl

Website: <https://www.agroberichtenbuitenland.nl/landeninformatie/mexico/landbouwraad>

Holland House Mexico

Address: Paseo de la Reforma 180, floor 20, 06600 Mexico City

Telephone number: +52 55 5025 8685

Email: events@hollandhousemexico.com

Website: <https://www.hollandhousemexico.com/>

Panama

Netherlands Embassy in Panama

Address: P.H. Oceanía Business Plaza, Torre 1000 Piso 23, local 23-A, Calle Hanono Missri, Punta Pacifica

Telephone number: +5072806650

Email: pan-ea@minbuza.nl

Website: <https://www.nederlandwereldwijd.nl/landen/panama>

Holland House Panama

Address: Edificio 181, of. P1-P2 (1o piso), Calle Gonzalo Crance, Clayton, Ciudad del Saber, Panama-City

Telephone number: (507) 2806665

Email: info@hollandhousepanama.com

Website: <https://hollandhousepanama.com/>

Peru

Netherlands Embassy of Peru

Address: Torre Parque Mar, Av. José Larco 1301, 13e verdieping Miraflores - Lima

Telephone number: +51 1 213 9800

Email: lim-ea@minbuza.nl

Website: <https://www.nederlandwereldwijd.nl/landen/peru/over-ons/ambassade-in-lima>

Agricultural Counsellor (part of agricultural counsellor in Bogotá)

Address: Carrera 13 No. 93-40, Piso 5, Bogotá

Telephone number: +57 (1) 638 42 22

Email: bog-lnv@minbuza.nl

Website: <https://www.agroberichtenbuitenland.nl/landeninformatie/colombia/landbouwra>



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The Regional Business Development LATAM
team (RBD-LATAM)

Rbd-latam@minbuza.nl

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ⁱ It is important to mention that the inclusion of specific Dutch companies in this report does by no means imply an endorsement on the part of the authors, the Netherlands Enterprise Agency or the participating Embassies of the Kingdom of the Netherlands in the region. The listed companies are just examples; others may offer the same or similar products and services.

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Prinses Beatrixlaan 2
PO Box 93144 | 2509 AC The Hague
T +31 (0) 88 042 42 42
E klantcontact@rvo.nl
www.rvo.nl

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