



Ministry of Foreign Affairs

Water Management

Commissioned by the Netherlands Enterprise Agency

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Rijksdienst voor Ondernemend
Nederland

THE **HAGUE**
UNIVERSITY
OF APPLIED SCIENCES

Group 2

Water Management

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Executive Summary

The Netherlands Enterprise Agency or the Rijksdienst voor Ondernemend Nederland (RVO) is organizing a trade mission to Colombia on the 25th of November. The goal of this mission is to give the opportunity to Dutch companies to explore business opportunities in Colombia. The main sector is water management concerning dams, pollution, river and drainage. In addition, there are two sub-sectors which are sustainable city development and lastly agro-logistics. The central purpose of this report is to provide enough information regarding water management sector in Colombia and giving a clear picture of the market overview of this sector.



Colombia faces a lot of challenges regarding water management. These challenges can be seen as opportunities by the Dutch companies. For instance, in Medellin the Bello wastewater treatment plant only treat 25% of the city's sewage. The other 75% is discharged into the Medellin River, an untreated posing threat to the environment.



Furthermore, Bogotá, depends on The Chiganza National Park as the shelter for three important rivers that provide 80% of Bogotá's water. The named source such as the Magdalena River has been providing hydric

resources in a great amount, however it misses a water management plan in order to improve the control the quality and the availability of water. The water management plan needs to consider the exposure of Colombia to climate change that affects the country constantly. Finally, Recent May a Dam have constructed by the government and EPM

The Chiganza National Park (which is owned by the city of Medellín) had flooded. Due to high water pressure, causing floods and landslides upstream. The crisis started already in April when a blockage in the diversion tunnel was breached. This resulted in the rise of water levels up and downstream.

In terms of sustainability Colombia has shown to be one of the Latin America most prominent countries. The government added 49 new articles for the environment and natural resources protections into the new constitution settled in 1991, implemented the Sustainable Development Goals (SDGs) and agreed to achieve the goals by 2030. In addition, the government estimated investments of USD 9.7 billion. Hopefully, all these measures will improve the water treatment, reuse, distribution and hydrometric. Approximately 97% of the urban population in Colombia has access to “improved” water and in the rural areas only 74%. The rural areas are the ones with the most critical issues and need investments.

When doing business in Colombia it is necessary to not forget import regulations and market constraints out of sight so therefore an analysis have been made on these topics. Not only these factors need to be taken into consideration but also the strengths and weaknesses of the Dutch and the threats and opportunities in the Colombian market is a necessary subject. After these descriptions the report presents a CAGE-model which clarifies the differences and distances between the two countries on cultural, administrative, geographic and economic matters. To top this information there is a Business Model Canvas to substantiate the strategic business models. At the end one can see the five forces of Porter which emphasize and describes the powers from multiple ends of the business chain together with examples of companies who are already investing in Colombia.

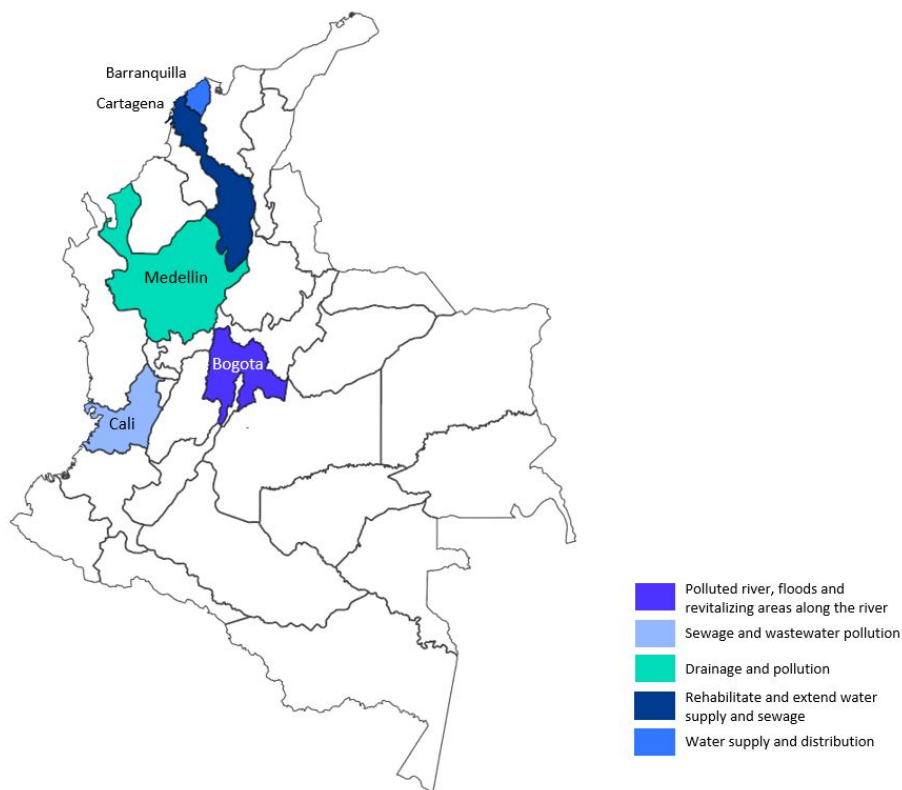
The key findings within the agricultural analyses are that the sector faces land conflicts and land access problems which is a great challenges because of the importance of the agricultural sector to the national GDP. The sector also has political and social problems due to the post war period. However, the sector has grown again with 40% in the second half of 2018. The Colombian government also strongly enhances the sector by protection. This also happens through funding the sector to minimize the damage due to environmental change.

Introduction

On the 25th of November, The Netherlands Enterprise Agency or the Rijksdienst voor Ondernemend Nederland (RVO) is going on a Trade Mission to Colombia. The Dutch Prime Minister Mark Rutte will be conducting the mission together with Steven Martina, Curacao Minister of Economic Development and Xiomara Ruiz-Maduro, Aruban Minister of Finance. The aim of the mission is to provide Dutch companies with business opportunities in Colombia. In the specific case of Colombia, the mission will be focused on the 4 sectors:

- Agriculture and Horticulture
- Life, Science and Health
- Water and Logistic
- Cycling Mobility

This research will present findings from water management, Sustainable city development and agro-logistics. In the case of Colombia, it was decided to focus on 5 main cities. These cities posse influence in the economy of the country and therefore are considerate to have the capital to invest in the water management sector.



Countries Analysis

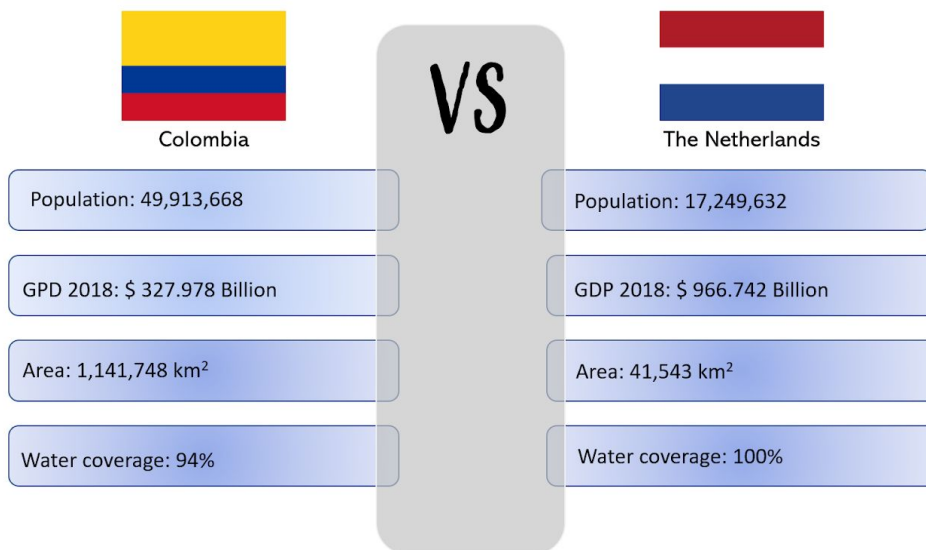


Figure 4 Netherlands Vs Colombia

It is hard to see if the Netherlands and Colombia have any similarity whatsoever. Especially, since Colombia lies on average 1000 meters above sea level, and has around 48 million inhabitants covering an area of 1,141,748 km² and a tropical environment. The Netherlands on the other hand, is only situated 1/3 below sea level with its lowest point at -6.76 meters and is densely occupied with 17.2 million residents in an area of 41,543 km². However, there are numerous correlations, particularly in the water management sector. These two nations build upon their harbors and agrarian activities for their economic growth. Furthermore, they both have a widespread river system and border mostly to sea. Global warming, plus rising sea level, enlarged discharge of (rain)water, also water quality are major challenges. This is a solid foundation for collaboration.

Both countries face comparable challenges when talking about managing water. After the impact of the floods hit reality in Colombia the former president Juan Manuel Santos asked the expertise of the Netherlands. The Dutch developed an advanced vision of managing water in Colombia. This decreases flood hazards by generating space for the water instead of

making rivers narrower by channeling them through dikes which are becoming higher. The plan also cooperates with investors with whom it grows state-of-the-art solutions that create a positive contribution to flora and fauna of Colombia.

Colombia plans to invest USD 13 billion over the next 10 years in continuing improving the water sector. The country has improved in recent decades, but coverage in the rural areas are still lacking. New laws were implemented to ensure the environment and resources safety. However, according to the World Bank the biggest issue of the water sector in Colombia is the high degree of fragmentation, which made economies of scale difficult to realize. Colombia has 1,123 municipalities and 800 of these are predominantly rural areas who don't have a water company. The water companies are mostly concentrated in the urban areas. The government National Development Plan for 2014-18 aims to change the reality. Private and public operators showed interest in developing into the other regions.

PESTLE – Colombia

Political analysis

In 1991, a new constitution was developed, and 49 new articles were included for the protection of environmental and natural resources. The change was called by experts the “Environment Constitution”, but for the Colombian people it meant more than that. Another big step was the creation of the Ministry of Environment in 1993. The new ministry created the National Environment System, implemented new regulations and national policies and included 5 institutions inside the National Environment System. The institutions are named:

- Institute of Hydrology, Meteorology and Environmental Studies
- Alexander von Humboldt Biological Resources Research Institute
- José Benito Vives de Andrés Marine and Coastal Research Institute
- Amazonic Institute of Scientific Research
- John von Neumann Environmental Research Institute of the Pacific

These steps improved the life of the population, but only 91% has access to "improved" water, from this 97 % in urban areas 74%, in rural areas. Approximately, 4 million don't have access to "improved" water. Sanitation another major problem in Colombia also improved, 81% of the population has access to "improved" sanitation in 2015.

Economic Analysis

Colombia is the 4th biggest economy in Latin America, after Brazil, Mexico and Argentina. The country is an emerging economy considered to have great potential for development. The Colombian economy is based on primary goods for exportation and consumer goods for the internal market. The economic sector is showing more and more concern for sustainably develop the sector, therefore the Green Growth Mission (Misión de Crecimiento Verde) was implemented in Colombia aiming to identify the threats and work on recommendations to improve the sustainable actions for private companies. According to the director of the mission, Hernando José Gómez, the Colombians companies are increasing their interest in sustainable ways of development during their projects, a great achievement for everyone.

GDP (USD Billion)	309.19
GDP per capita (USD)	7600.76
GDP growth rate	0.60
Working Population	49.29
Unemployed rate	9.50
Inflation rate	3.23
Exports	3.50
Imports	4.58

Figure 5 Colombia economic factors Social Analysis

In 2017, the median age in Colombia was 30 years what create a demographic advantage in terms of the number of people of working age. The pension and healthcare system improved in the last years, despite the corruption that affect 30% of the pension coverage. The government is conducting several reforms in the system and hope to increase the pension system coverage and improve the quality of healthcare services.

The major social issues of Colombia are high-income inequality and continued violations of human rights. The high minimum wages and high non-wage labor costs increase the informal labor market which exacerbates the income inequality.

In the urban area, 97% of the population has access to water or the so called “improved water”, however in the rural area only 74% has access to water. Agriculture is essential in a country and the water is the key element. Without water they cannot survive or cultivate, the production of food depends on the water supply. Mining is a sector that jeopardizes some of the water resources of the country. The government created measures to diminish the mining activity, but some illegal miners continue working.

Technological Analysis

Colombian technology revolutionizes water treatment in the hydrocarbons (an organic compound consisting entirely of hydrogen and carbon), a group of Colombian experts in hydrocarbons patented a technological device that generates production water at a lower cost, with the extraction of oil. The researchers of this device work at the company Alianza ingenieria. Alianza seeks a solution for the negative environmental impact of water that is produced next to the hydrocarbons, developing a microbubble generator that on average for a plant of 10 thousand barrels can cost around 200 thousand Dollars. Both the water produced and the injected sprout together with the hydrocarbons and that generates pollution if it is not given proper handling. Innovation has already been incorporated into five marine platforms in Peru.

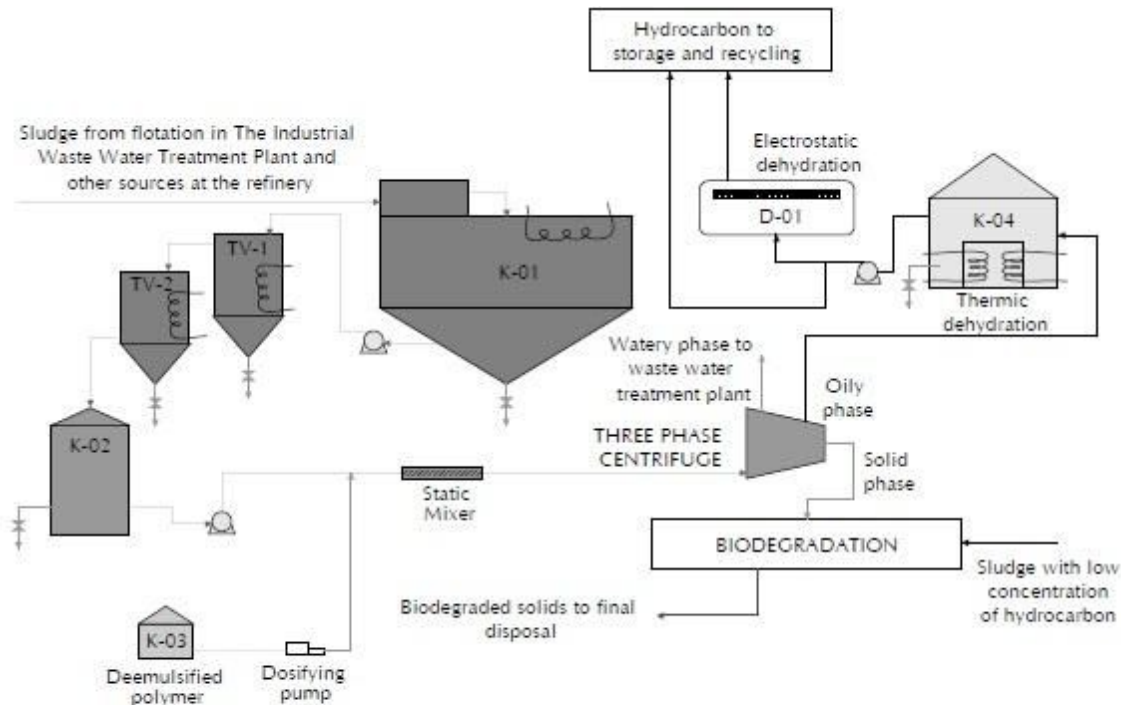


Figure 6 - Hydrocarbon waste water treatment plant

Environment Analysis

The climate change, the increase of the population and the vertiginous industrial development, have brought a concern to the Colombians about a possible future absence of water. Despite having an enormous amount of hydric resources, Colombia is not able to manage the sector in the most profitable way. The development of cities that concentrate a large number of people in a small area has affected the ecosystems and the deficient supply of drinkable safe water. In the case of Bogota, the largest city in Colombia, it's expected to have 3.5 million more inhabitants by 2050 and a housing demand of 2.7 million, which will require greater efforts in the water supply. Therefore, its crucial to the government to improve the management of the water sources. Otherwise, it could result in water scarcity for the future generations of Bogota.

The 2030 Agenda of Sustainable Development Goals includes clean water and sanitation, sustainable cities and communities. The goals (6,13,14) aim to improve life, environment

protection and water preservation, since this natural resource is considered very important and need to be taken into consideration when developing a nation.

As an example of how challenging those goals are for Colombia, 58% of the agricultural production units (UPA) depends directly on the water from the ecosystems due to the lack of the infrastructure of the irrigation systems. As a consequence, they are also dependent on climatic conditions such as rainfall. This affects approximately 500 municipalities of the nation that depend on rainfall for crop growth (Portafolio, 2018).



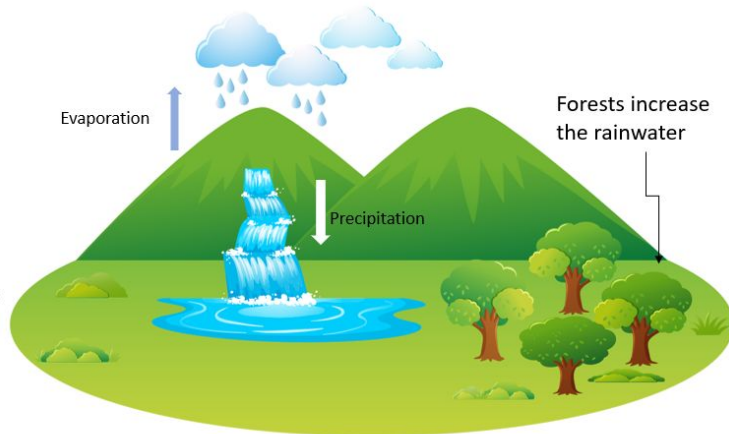
Figure 7- 17 Sustainable Development Goals

Legal Analysis

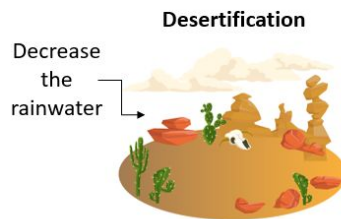
As mentioned before, the new constitution of Colombia elaborated in 1991 brought prosperity to the environment aspect. However, in 2015 a bigger step was achieved in the country in terms of water preservation. The area of El Páramo de Sumapaz produces 85% of the drinkable water in the country and occupy just 1.7% of the national territory. Although, the importance of the region, nothing has been done to preserve the area and large-scale mining activities were threatening the existence of the Páramo. In 2015, the government decided to change this problematic situation and implemented a new law to eradicate the mining activities and the government developed a supervision system with the national guard. The new legal framework was able to develop the homegrown solutions and manage other

models used in other countries to suit the different conditions and circumstances of Colombia.

Los Páramo area supply
85%
of the water in Colombia
Each year
3%
of the glacier mass of the mountains are lost
85%
of the rain becomes surface water supply



River Pollution
Every year
756 tons of biodegradable organic material
918 tons of chemical substances
205 tons of mercury are discharged into rivers and soils



Usage of Water

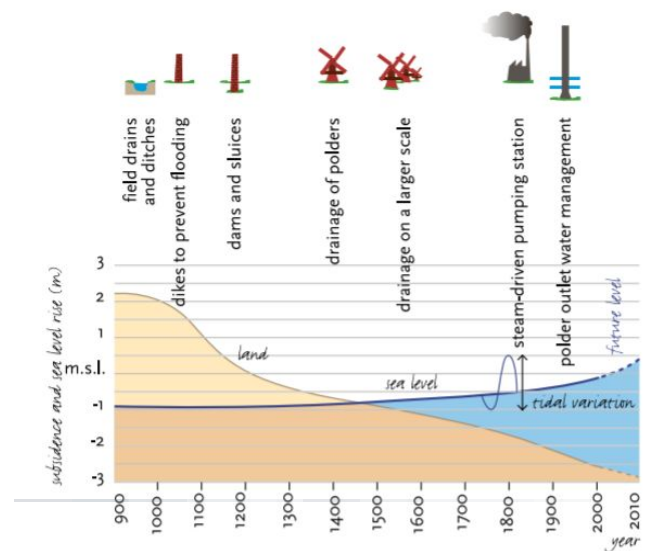
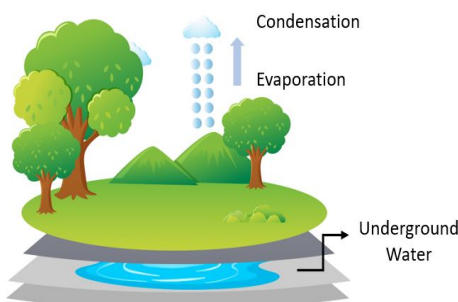


Surface water supply
2'011.655mm³

Underground water supply 5.848 mm³

Water demand
35897 mm³

- HYDROCARBON 1.6%
- MINING 1.8%
- AQUACULTURE 4.6%
- INDUSTRY 5.9%
- DOMESTIC 8.2%
- LIVESTOCK 8.5%
- ENERGY 21.5%
- AGRICULTURE 46.6%



, Development of water management since 900 A.D.

PESTLE – The Netherlands

Political Overview

In the Netherlands, the government is responsible for water management. The name of this department is called Rijkswaterstaat which was founded in 1798. From there on water management sector kept developing in the sophisticated water networks we know today. However, in 1953 there was a critical turning point in Dutch history which was the “Watervloodramp” which was a flood disaster that killed 1876 people. Hence, the Dutch constructed the Delta Works. In total 13 Delta Works were created, and the last Delta Works was constructed in 1997 this prevents another flood disaster from happening (Rijkswaterstaat).



The Prime minister of the Netherlands went on a visit to India to discuss different matters. One of those matters were the bilateral agreement of cooperation regarding water management. There was a campaign made which was called Clean Ganga campaign which educates and cleans up the Ganga river (MEA). Also, Water in the City is a project that the Dutch help the Indians with to help the transition towards a circular economy (Alternate). The Dutch water institutes are guiding these processes such as Deltares and IHE Delft. Deltares is active in Colombia regarding water management. Colombia can use this project to benchmark their progress and implement it in their country.

Economical overview

The Kingdom of the Netherlands has a diverse economy with a strong sector in services. Furthermore, the Netherlands is the gateway for Europe with the port in Rotterdam & Amsterdam. Many of the goods outside of the EU travel to the port of Rotterdam and are then transported to their final destination in Europe.

In 2017 the Netherlands was ranked first of port infrastructure out of 137 nations, according to the Global Competitiveness Report of 2017 and 2018. The port of Rotterdam is considered to be the best port of the globe.

Social overview

To get a sense of the culture in the Netherlands Hofstede's dimensions can help to identify and portray cultural aspects. This part will take the Dutch people to benchmark the culture in Colombia using the Hofstede's Dimensions. As can be observed from the figure below where the blue bars represent Colombia and the purple represent the Netherlands. At first glance, the Netherlands and Colombia don't score very similar on the 6 Hofstede's Dimensions.

When analyzing Individualism, Masculinity and Long-Term Orientation you can see a huge difference. The Netherlands scores low on Masculinity due to the fact that Dutch people value equality, quality in their working lives and solidarity. The Dutch resolve conflict by having long discussions until they reached a compromise, Hofstede calls this a feminine society. The Colombians on the other hand, score almost 5 times higher on Masculinity. Moreover, the Dutch score almost 5 times higher on Long Term Orientation. Meaning that the Dutch are easily adapting tradition to changed conditions and believe that the truth depends on certain circumstances. In contrast, The Colombians have strong opinions about

certain ideas and work, keeping to traditions and not thinking about the future. This drives the Colombians for quick results instead of the bigger picture (Hofstede).

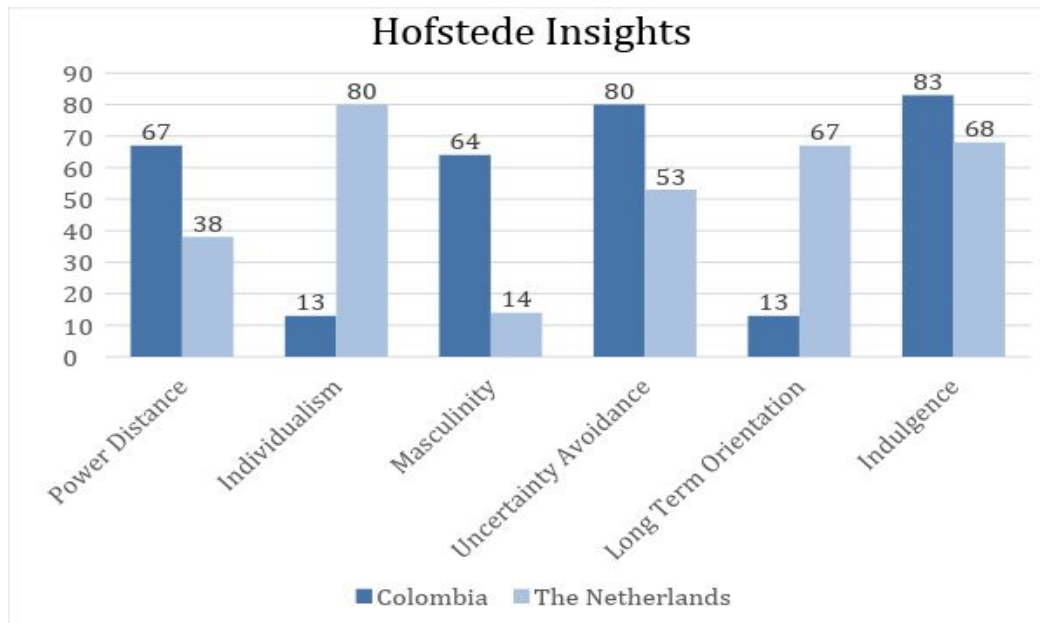


Figure 12 Hofstede Insights

The Netherlands scored 924 out of 1000 points according to the Euro Health Consumer Index of 2017. Therefore, the country is the leader of healthcare in Europe (Euro).

Part-time employment in the Netherlands is the highest of all OECD countries. the OECD claims that 18.9% man and 59.8% work part-time in the Netherlands

Technological overview Social overview

The Netherlands, or the ‘lower land’, has been dealing with risks of their land being flood due to the fact that the land is below sea level. This does not only involve seas but also canals, rivers and lakes. Dealing with this enormous and serious problem, the country has developed strategies to enable living in lower Delta areas. The government of the Netherlands explains that this success encompasses four important strategies, being; eco-engineering, water safety, smart dikes and livable Delta’s (Rijksoverheid).

Water safety focuses on the protection of regions against flood risks and high-water levels. This can be achieved by either establishing sea and river technologies. On sea level, this is developed by implementing the new Flood Control 2100 presenting the most influential ideas for flood control in the Netherlands (Rijksoverheid).

Not only a high quantity of water poses a problem. Extreme drought can occur in regions dealing with too much water as well. This is a serious threat as well since it affects agriculture, shipping, the energy sector and nature (Rijkswaterstaat).

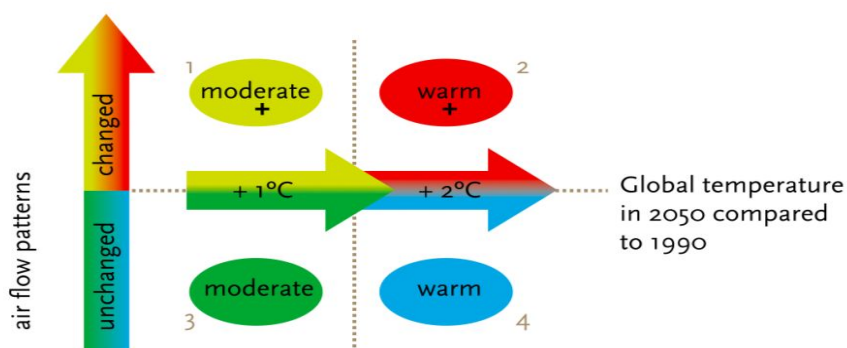
Environmental overview

As presented by the Dutch Flood Control 2100 program, the water safety in the Netherlands does involve not only the technologies as presented above but also climate adaptation.

In the coming century, the sea level is expected to rise 80 centimeters (Rijnland). This means a maximum sea level rise of two meters.

Moreover, temperatures are expected to rise from between 1.1 to 6.4 degrees Celsius between 1990 and 2100. Experts argue that for the case of 2 degrees rise, changes will be enormous. Mainly, because sea level will eventually drastically rise (Rijkswaterstaat).

In order to, as carefully as possible, predict climate change, the Dutch institute KNMI designed four different scenarios. The main outcome of this prediction can be regarded as the



more and more. This will
s and regions. Making

predictions of environmental changes, allows us to anticipate this significant change.

Legal overview

The main focus of legislation concerning water management in the Netherlands is the protection of established projects and measures to prevent floods in the country. In the Netherlands, the management and water systems have been controlled by the implementation

of the Act of 29 January 2009. Moreover, it also protects the quality and quantity of water in the Netherlands. Lastly, the act also takes nature, urban planning and the environment into strong consideration when planning water management innovations (Rijkswaterstaat).

The ideology behind the water management legislation involves all actors being bound by the same rules. Only licensed parties can adjust existing systems or facilities. These licenses are controlled and handed out by government officials or competent offices.

Moreover, communication between the national governments and municipalities are essential in successful water management. Due to the fact that certain measures require the support of different regions because of a river crossing multiple municipalities. The actor which informs all stakeholders and actualizes the projects concerning water safety is the Water Control Board (Rijnland).

Water management

Did you know that the Netherlands fits 27 times in Colombia? The size of the country makes managing water much more challenging than it does in the Kingdom of the Netherlands. Furthermore, The Amazon in the south and the rural areas in the country are occupied by drug traffickers and guerilla groups, which can scare of potential investors. Further, the mountains don't help the improvement of the infrastructure either. Despite all these different factors, Colombia has invested in Hydroelectric dams which provide sustainable energy. At first glance, Colombia can look quite intimidating to enter as a Dutch water management company. However, these challenges that this country faces create opportunities for the Dutch companies to further improve water management in Colombia. This section will cover the different aspect of the water management sector such as: Dams, water pollution, river and drainage.



Figure 15 Colombia 27 bigger than the Netherlands

Dams

Colombia is the third largest producer of production of electricity by the force of fast-moving water. The most important ones are located between the Gold Triangle (Medellin, Bogotá and Cali). These Hydropower dams produce 11,726 MW which accounts for 86% of the domestic electricity generation (2017). Due to these dams Colombia is ahead in reducing its gas emission by 20% in 2030. Colombia is also the first non-European count in the top 10 of the Global Energy Architecture Performance Index.

Hydroelectric	Capacity MW	Location
San Carlos Hydroelectric Power Plant	1,240	San Carlos
Alberto Lleras (Guavio) Dam	1,150	Guavio
Chivor Hydroelectric Project	1,000	Santa Maria
Sogamoso Dam	820	Bucaramanga
Porce III Dam	660	Medellin
Miel I Hydroelectric Station	396	Norcasia
Ituango Dam	2,456	Ituango
Guaicaramo Dam	1,750	Casanare

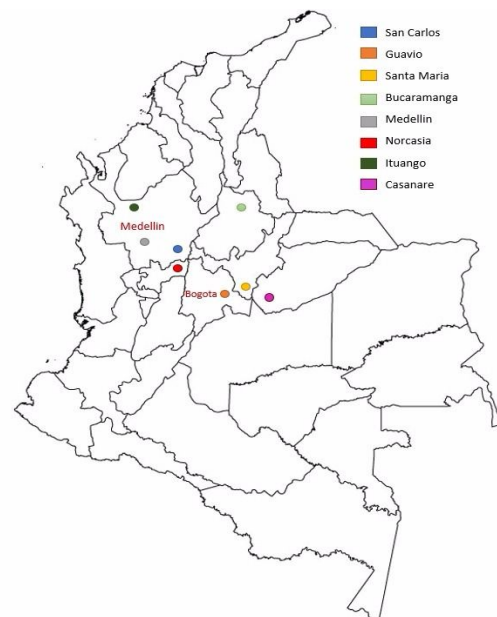


Figure 16 Location of hydropower dams in Colombia

The largest hydropower station is currently being built and will account for 2400 MW per year. This plant is situated in the Ituango and flooded while it was built.

Furthermore, Recent May a Dam have constructed by the government and EPM (which is owned by the city of Medellín) had flooded. Due to high water pressure, causing floods and landslides upstream. The crisis started already in April when a blockage in the diversion tunnel was breached. This resulted in the rise of water levels up and downstream. Ten of thousands of people have been ordered to evacuate the area due to the heavy floods. The people of the Ituango area protested against the project of building this hydroelectric dam. Some activist got shot down according to the Guardian. The dam accounts for generating an annual average of 13,930 gigawatt hours. The project should be finished and operating by December 2018.

The recent dam construction was carried out by contractors from Chili of the Ferrovial Agroman Chile (60%) and (40%) by Constructors of Colombia. This recent flood of this dam can be blamed on the current contractors that are building the dam. The Dutch however, were able to build 13 sections of dams which are called the Deltaworks. The Dutch have preventing approach to all of the water management related issues in the country. However, the size of Colombia and the geographical challenges are much higher compared to the Netherland. As Colombia is still climbing up the ladder of developing countries with stable annual growth in GDP the future of the country seems to head in the right direction. This growth will attract Dutch companies that specialize in dam relating problems.

Water Pollution

Another big issue which is developing over time is the pollution of water resources. According to the coordinator of Conservation International, Cesar Ruiz, the problem began with the deforestation of the Andean Forest and the transformation of grasslands, to expand the area for agriculture purposes. Along with the deforestation and expansion of the agricultural area, the displacement of communities also has been causing a decrease of hydric resources (Colombia Reports, 2011).



Figure 17 Andean Forest

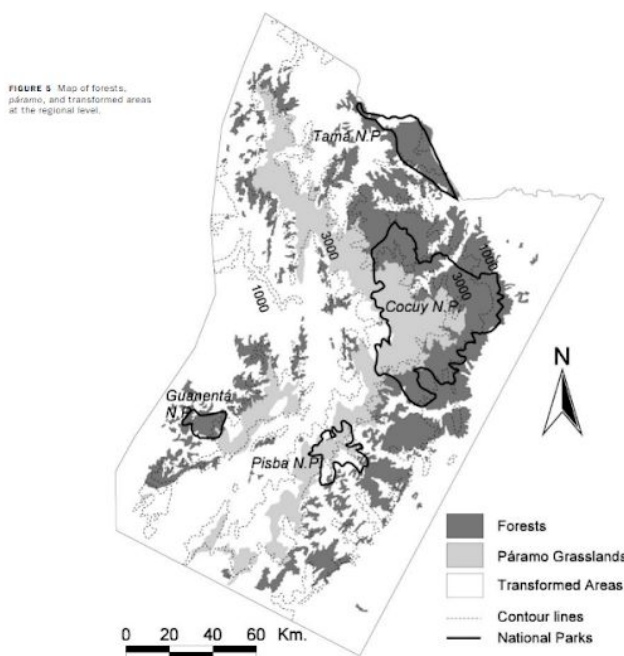


Figure 18 Areas of deforestation in the Andean area

The industry sector has a very important effect on the supply and demand of the available water. The biggest consumer of water is the agricultural sector, followed by the industrial sector and then domestic consumers along with urban services. The mineral industry is a big player in this issue as the mineral waste is highly poisoning.

The lack of infrastructure and planning of treatment for industrial, agricultural and domestic sewage leads to an intensive decrease of the usable water resources. Most of the sewage goes back to the rivers polluting the water. Although the government has created regulations and fees against water pollution, there is no proper surveillance which encourages the non-compliance of many. The demand is for an urgent plan that will improve the water supply by protecting the rivers that cross the cities and get polluted on the way.

River

Besides being one of the richest countries in terms of water resources, Colombia hasn't been able to manage the economic water scarcity due to the lack of infrastructure. One big challenge is considered to be the location of the majority of populations not matching the places with abundant water resources.

At the end of the 19th century, the coffee market and economy brought demographic changes and altered the mind of the marketeers and the interests of the consumers. Many cities started to emerge in the central area of Colombia due to mild climates. Therefore, the "gold triangle" (Triángulo de Oro) emerged as a result of the industrialization process, gathering three major cities: Bogotá, Medellín and Cali.



Figure 19 Golden triangle



Figure 20 Colombia's water distribution problem

(Conexao Pacifico 2018)

The major population lives in the area known as Cordillera Central, where the most important river of Colombia, the Magdalena, crosses the Gold Triangle. This river is an important hydroelectric source for the country as well as a strategic path for transportation of goods.

The capital of Colombia and also one of the largest cities of Latin America, Bogota, depends on The Chiganza National Park as the shelter for three important rivers that provide 80% of Bogota's water.

The named source such as the Magdalena River has been providing hydric resources in a great amount, however it misses a water management plan in order to improve the control the quality and the availability of water. The water management plan needs to consider the exposure of Colombia to climate change that affects the country constantly.



Drainage

The announcement of the bilateral trade mission from the RVO was to focus on the 5 main cities of Colombia. This part will focus on the 2nd largest city of Colombia which is Medellín. To understand the drainage system of Medellín we must look to the water system of the whole area. The company that is responsible for drinking water and sewage service is called Empresas Públicas de Medellín or in short EPM. They are responsible for the liquids of more than 3



million people, this includes the surround municipalities in the region, which is called the Aburrá Valley. The Aburrá Valley covers a length of 60 km which is illustrated in figure 10.

The Water Distribution System (WDS) consists of 11 water treatment plants all around the metropolitan area of Medellín. The WDS comes for 27 sources

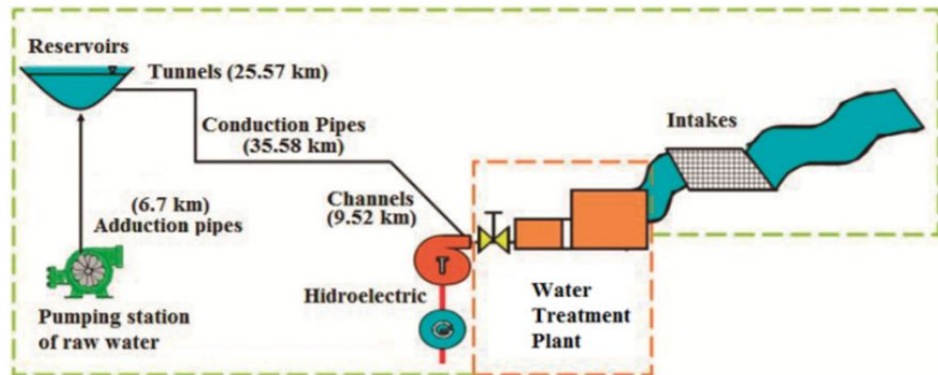


Figure 22: Drainage system

of rivers and ravine and 3 tanks with a total volume of 199 million m³. After capturing the water from the direct source in-dependent systems clean the water before it is distributed to the people of the Medellín region. This area struggles with distributing the right amount to the right region. Therefore, a structure has been made to drive water from one water-basin to the other. Currently, there are 3 pumping stations of untreated water, 27.3 km of tunnels and 38 km of pipelines. This process is demonstrated in figure 7.

The main distribution of this process is to transport drinking water from the water treatment plant through 267 km of pipes to 110 storing reservoirs in 10 different cities. The transportation of the water is done by the force of gravity. The 3 Water Treatment Plants are situated at 1699, 1750 and 1760 meter above sea level. Most of the development of these stations around the valley of Aburra in the mountainside. Since the start of the process a total of 34 pumps have been installed, to safeguard the supply of water to the surrounding population.

Sewage

In the Medellin metropolitan area infrastructure is developed for the collection of industrial and household wastewater. Further, rainfall is collected from the roads and roofs. There are three main wastewater treatment plants in the area. In total there are 1645 spillways to separate the flow of excess rain water and lead it to water receivers such as rivers or ponds. To prevent the area from flooding 74,000 drains are installed. These drains need a sewer system, this sewer is 372 km long (Giraldo). Unfortunately, in Medellin the Bello wastewater treatment plant only treat 25% of the city's sewage. The other 75% is discharged into the Medellin River, an untreated posing threat to the environment.

Sustainable City Development

Latin America is one of the most urbanized areas in the world. Approximately, 76% of Colombia's population lives in the cities according to the World Bank. The agriculture sector represents only 7% of its Gross National Product (GDP). The people left the rural areas seeking a better life in the cities with access to electricity, water and infrastructure. Unfortunately, not all of them were able to have a better life and now live in the favelas, villas miserias and surrounding areas.



Figure 24 Comuna 13 in Medellín

The abrupt urbanization brought several problems, but water is one of the biggest issues. Water is essential for human survival and is not solely beneficial for the population but also for the economic prosperity of a country. Therefore, it is crucial to find sustainable ways to manage water. Technological innovation made possible to increase the productivity of water management and enhance environmental preservation. The Netherlands is worldwide known for its innovative technology, creativity and issues concerning water management. This makes the Dutch companies an attractive business partner.

Water Supply

Approximately 97% of the urban population in Colombia has access to “improved” water and in the rural areas only 74%. The development of the water supply can reduce costs, ensure a better quality of water and increase the number of people that have access to clean water.

Colombia has a few aspects that can be improved such as:

- Groundwater extraction expand aquifer system
- Using little energy with highly efficient pumping
- Install rainwater tanks in areas with suitable rainfall patterns
- Recycle wastewater
- Regular manutention of water equipment
- Sewage treatment as an additional source of water
- Use innovative technology to predict rainfall time scale and climate changes
- Deploy satellite and airborne sensors for early detection of water pollution

These are some of the alternatives that can be done to increase the quality and volume of water supply. The Netherlands has to deal with constant climate uncertainties and developed an efficient system which Colombia could benefit from.

Hydroelectric

Hydropower supplies 70% of the energy capacity of Colombia. The country produces 11,726 MW and it has the third largest installed hydropower capacity in South America. In 2017, the energy production of hydropower increased to 86% after four years with continuous stability. However, according to in the Netherlands Statistic Center (Het Centraal Bureau voor de Statistiek) only 0,08% of the energy used in the country is supplied by the hydroelectric source. In conclusion, the Netherlands does not have companies who have experience in hydroelectric. Most of the energy comes from windmills.

Treatment and Distribution

In 2013, regulators in Colombia announced that over the past two years they had inspected 333 of Colombia's 562 wastewater treatment facilities and their findings were shocking. Of those inspected, 89 facilities were found to be inoperable. In August of 2018, the Export Organization published an article stating that only 31% of the wastewater is treated in Colombia but to improve the system the government is planning to invest USD 13 billion in the next ten years. The government aims to attract private companies to develop projects. In this case, it is possible to see a great opportunity for Dutch companies. The Netherlands has several companies dealing with water treatment in the country and it is one of the few regions which do not use chlorine at all on its water. The Dutch system is well developed and uses sustainable practices. The system only uses safe ground water and the best available sources, plus prefers physical process treatment such as sedimentation, filtration and UV-disinfection. The distribution channels are well maintained to avoid microbial growth or any further damage, and the material used is biostable. The distribution method is fundamental in the process of water treatment. Besides the regular manutention, an additional monitoring system was created to prevent any problem.

Re-use

Colombian designer Alberto Vázquez created a simple system for reusing water from the shower after bathing (Gris Water Saving System). The device, which consists of four concave parts, has the capacity to collect 90% of the water used in the shower, which represents between 30 and 40 liters of the precious liquid. Once in the device, the water can be reused for watering plants or filling up the toilet tank. This device, developed in mid-2014, has entered the market in 2015 with an average price of \$30.

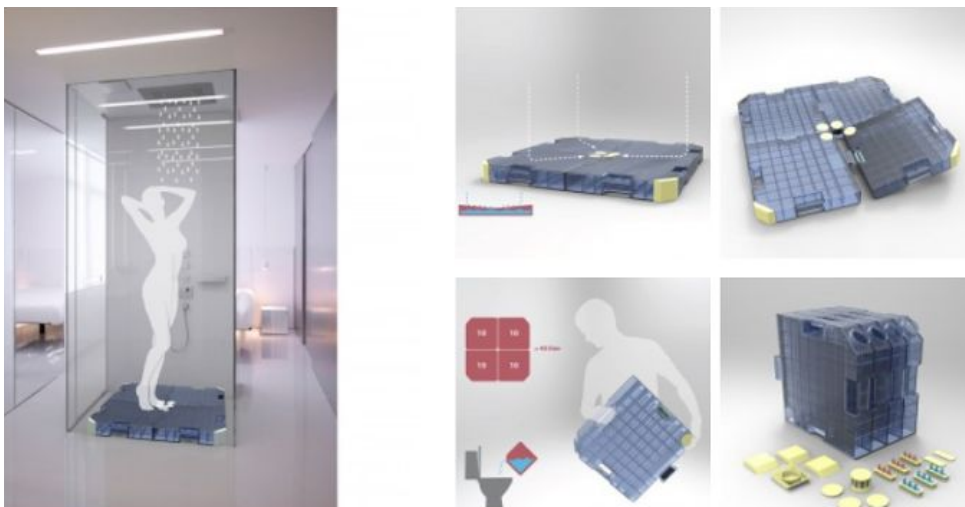
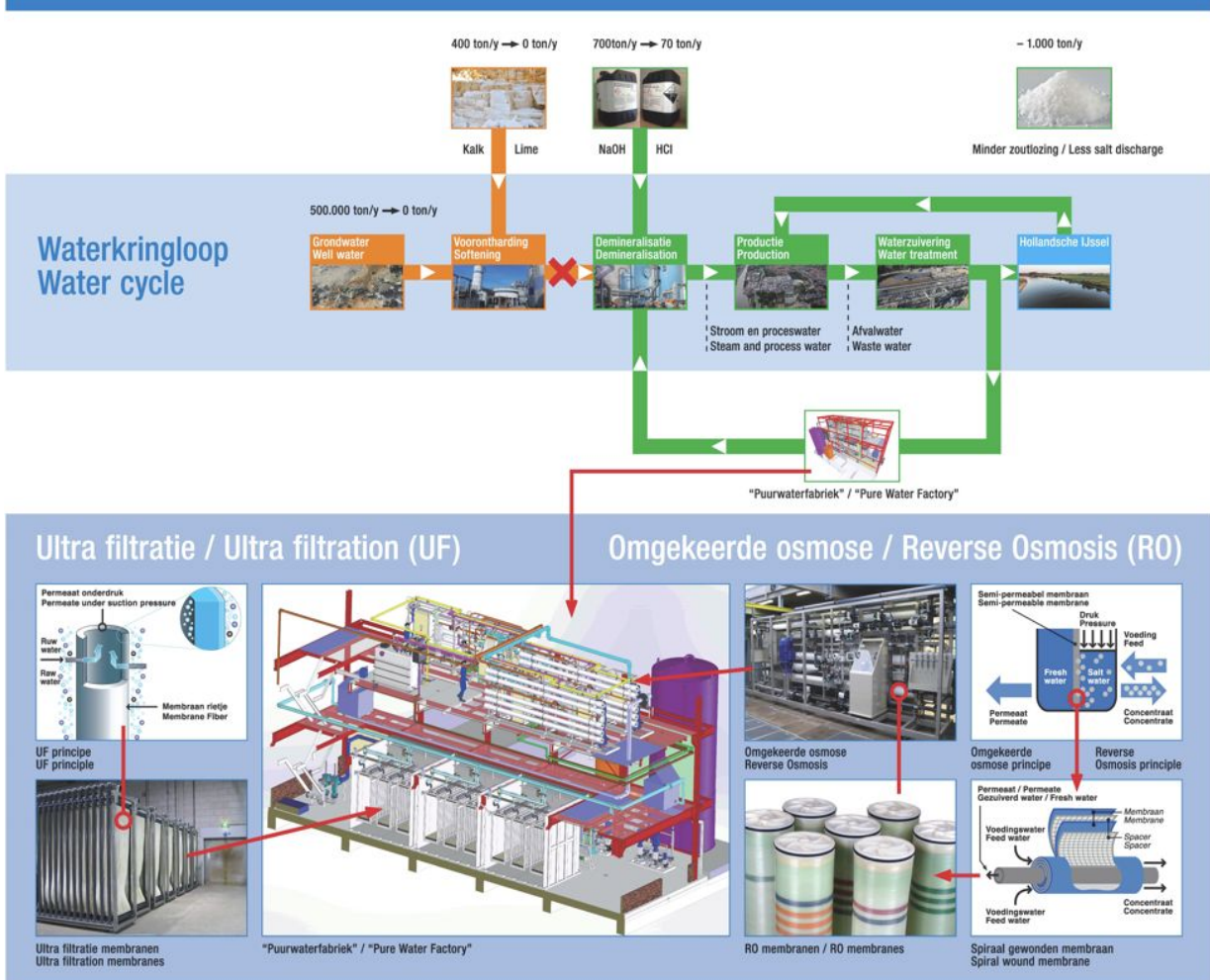


Figure 25 Treat water to steam vessels

The Croda company is a British company that developed a new and innovative machine that treat water to steam vessels. Within this process, it's possible to reduce 90% of the chemical usage and protect the environment. The Dutch company Logisticon Water Treatment was the first company to test the machine and gained the authorization to design, build, deliver and install this intellectual property. The figure below demonstrates the process.



CRODA



Figure 26 CRODA system

Agro-Logistic

Throughout history, the Colombian agricultural sector has been suffering from land conflicts and land access problems. This can be regarded as quite problematic due to the fact that the sector has been one of the main influencers of the GDP of the Latin American country. Also, the political and social problems within this sector, allowed illegally armed forces to claim lands and therefore, the sector experienced difficulty growing and developing in the post-war period (1950 to 1989) (Gaviria, 123-130). Moreover, after the opening of the Colombian markets in 1990, the international demands strongly influenced the production of certain commodities, which resulted in shifts in production. This also declined the sector due to the different trends in demand. The demand shifted from cereal to vegetables and other commodities, which did not create strong enough incentives to present growth (Gaviria, 140-143).

Nonetheless, as the research of Michael Page addresses, the agricultural sector, after periods of strong decline, it has grown again with 40% in the second half of 2018 due to the diversity of the agricultural facilities and the demand for an increase of different commodities (Gaviria, 123). This in both the domestic as in the international markets. The main markets of the Colombian agricultural exports are the EU, the US and Russia (Esmerk, 2018).

Moreover, the government in Colombia strongly enhances the sector by protecting (smaller) agricultural companies, farms and peasants. The minister of agriculture, Andres Valencia Pinzon and the fund Finagro invested 9.5 million US dollars in a program to aid agricultural companies by installing insurances to minimize the damage due to environmental change. According to the minister, these implementations are crucial to maintaining growth and securing economic stability for the sector (Business News Americas, 2018).

Import regulations Dutch products and constraints

If we want to answer this question we first need to discuss which products Colombia import the most from the Netherlands because the import regulations are different in each sector.

According to the CBS (the Dutch central office for statistics) the most exported products from the Netherlands to Colombia are machinery and chemical products. (Statline, 2018)

Normally, there are no regulations for importing goods into Colombia, but machinery and chemical products are not ordinary importing goods. When you are considering exporting machinery to Colombia there are certain regulations you have to abide by. Whenever products are imported by Colombia it will be controlled by DIAN (the Colombian tax and customs national authority). (Colombian Tax and Customs National Authority (DIAN), 2018)

The regulations around the importation of machinery depend on the frequency and amount of exportation by the company in particular. When your company is recognized by DIAN as a Highly Exporting User (ALTEX, as a Spanish acronym) you will receive tax and administration benefits. Normally your company will have to deal with VAT (Value Added Tax) and will be subjected to 0, 5, 10, 15 or 20 percent customs duties over the CIF (Cost, Insurance and Freight) value. (Dávila, sd)

When your company is recognized as ALTEX you don't have to pay those duties. But when is your company recognized as highly exporting? There are three conditions your company has to match. The first condition is to reach a FOB (Free on Board) exporting amount of 2.000.000 USD within twelve months and the value of exports must reach a 30 percent of the number of its total sales in the same period. If one of these conditions is not matched than the company needs to make an official request to ALTEX and they will ask for altered conditions. (Foreign trade and customs, 2018)

The regulations for chemical products are insecure. Colombia is busy setting up a new chemical framework for 2019 wherein the country anticipates requiring industry to guide risk assessment only for new substances. It is still not sure what imported chemicals will be

subdued to reporting regulations. (South America sees chemical regulations moving forward, 2018)

Constraints in competitiveness that hamper market entry in water management for Dutch companies

There are a lot of companies that are in Colombia or serving Colombia in the sector of water management. Therefore, a few filters have to be applied to narrow the list down to the most threatening companies for market entry of Dutch companies. The specific search was: water treatment companies that are serving Colombia. The working area for the potential investment is set to be in Bogota, Cali or Medellín in order to be specific because of the large differences in geographical situations in Colombia. When specifying the search to these requirements three potential big companies, that can hamper the market entry for Dutch companies, are coming forward. These potential competitors are Acciona, WABAG, Azud. (Water treatment, sd)

Below is a graph with these companies and additional information that is important for market entry

<i>Companies</i>	<i>Based on</i>	<i>Main industries</i>	<i>Characteristic</i>	<i>Employees</i>
<i>WABAG</i>	Austria	Water supply and Sewerage water	Experience	1.600
<i>Acciona</i>	Spain	Construction and operation water plants	Sustainable	38,031

Azud Spain Irrigation, Technology 100-249
filtration and
water treatment

These companies could be a threat for market entry by Dutch companies on water management in Colombia. There are more companies that are dominant in the market, but the accent on these three companies is because of their different industries within water management and their different characteristics. (Credit risk monitor, 2018) (Azud, The Culture of Water, sd) (About Acciona, sd) (The Company, sd)

SWOT Analysis – Water Management

This SWOT analysis is constructed to get a clear overview of the water management sector. Water management is quite a broad sector, to narrow it down this analysis will cover only a few subjects. This analysis will show the Strengths of the Dutch companies in this sector and show the opportunities Colombia has to offer for these water management companies. Furthermore, there are several threats that a Dutch company faces when entering the Colombian market. The weaknesses of the Dutch company will be demonstrated as well.



✓ STRENGTHS

- The Netherlands is known for the advanced technology regarding water management: agriculture, clean water, drainage system and reuse wastewater
- Created land space by draining water
- A competitive business cost environment
- Better infrastructure
- Government support
- Rich countries in terms of water supply.

✓ OPPORTUNITIES

- Colombian Government support
- New trade agreements
- Foreigner investment
- Dutch technology
- Areas like sewage, waste/reuse, prevention to pollution, water supply and distribution, drainage need improvements
- Colombia changed the constitution to improve environment regulations
- Urgent demand for a water supply plan

✓ WEAKNESSES

- Geographic conditions
- Infrastructure
- The main urban areas don't have a proper sewage, waste/reuse, prevention to pollution, water supply and distribution, drainage system
- Lack of technology
- High degree of fragmentation making Economy of scale difficult to realize
- Lack of infrastructure on irrigation system

✓ THREATS

- Global economic uncertainty
- Hydroelectric can be challenging for Dutch companies only 0.8% of the Dutch energy comes from waterpower
- Corruption
- The Netherlands is used to deal with flat land and relatively small size spaces
- Competition : Germany, Spain and neighbors in South America
- Drug activity in the rural area and guerillas

Strengths

When talking about water management the Netherlands comes in to mind. The Dutch's were able to extend their territory thanks to the development of new water management technologies and two-thirds of the country would be flooding if it was not for the sophisticated dikes and surge barriers systems. The country is the 8th largest export economy in the world with only 41,543 km². Besides, the technology developed to use less space to plant the irrigation system of the Netherlands farmers is highly advanced. The water treatment is globally renowned for the innovation system, and the country is one of the few that treat drinkable water without chlorine or fluoride. The Dutch government invests approximately € 8 billion a year in the water sector and employs more than 35,000 workers. The government also created platforms such as the Netherlands Water Partnership (NWP) where they promote international cooperation. The primary focus on the water sector in the country is the exportation of knowledge and continuous innovation research and development.

Weaknesses

When discussing the strengths of the Dutch the advantages were evident regarding the water sector. Currently, the weaknesses will be presented in the areas that Colombia is developing poorly, concerning the water management sector.

Colombia has large resources of water; however they are unequally distributed within the country. The Magdalena-Cauca-Caribe hydrological region possesses 80% of the Colombian water resources.

With the geographical difficulties, it is hard to distribute water, that is suitable for agricultural purposes and water supply of the cities around the Magdalena area. The country's geographic plays an important role in the lack of infrastructure and water distribution.

As the statistics show, Colombia has periods of heavy rainfall. The lack of water transportation technologies and water storage leads to periods of drought in different regions of the country.

Moreover, the coffee production in the country leads to environmental damage and a 'grey water' footprint. Because of large water scarcity due to the drought in some parts of Colombia, farmers and municipalities must control their water footprint to preserve sources of fresh water. This concerns multiple irrigation techniques and strategies that Colombian farmers do not master yet. Another important area, which Colombia needs to develop is water treatment. Only 25% of the sewage of Medellin is treated before being sent in nature.

The new administration of President Iván Duque, which took office in August 2018, continues with current policies that lead to new opportunities in terms of sustainability in the country. The nation faces several challenges to ensure a more sustainable way of living. Especially, in the water sector, which is a very delicate and critical aspect for the population's life.

Opportunities

As mentioned, Colombia has one of the richest water resources in the world. Consequently, being a large opportunity for the water management sector. The usage of water resources for agricultural businesses, water supply, treatment, distribution, dams, river management and sewage are not well established. However, the government estimated investments of USD 9.7 billion nationwide (USD 1.1 billion).

The government added 49 new articles for the environment and natural resources protections into the new constitution settled in 1991. Add the Green Growth Plan for 2030 (Environmental Protection and conservation of Water Sources)

The country has many water resources that could, in fact, solve periods of insufficient water supply. To stress this, the Magdalena and Cauca river basins would, in theory, support 66% of the Colombian population while it contains only 13% of the water supply. However, the economic situation strongly influences the actual presence of water. This is due to underdeveloped infrastructure and other constraints. Therefore, water resources and the little know-how of water management and enough water supply present opportunities to foreign companies.

In September of 2015, Colombia implemented the Sustainable Development Goals (SDGs) created by the United Nations Development Program (UNDP) and World Bank Group

(WBG). The agreement state that by 2030 the countries achieve all the sustainable goals. The goals are related to end poverty, promote equality, protect people and the planet.

Threats

The global economic uncertainty is a problem that can affect big water management related projects negatively and delay transactions. El Nino and la Nina pose climatological problems towards the country. The phenomena result in cloudy skies, blocking sunlight and heavy rainfall in certain regions.

When considering investing in Colombia, there are multiple challenges to take into account, such as cultural adaptation. When starting (to invest in) a project in Colombia, there are different cultural differences in doing business compared to the Netherlands. Not only cultural barriers will be faced, but also the land in Colombia can be a barrier for your business, especially in the rural areas.

A lack of electricity can also be faced in some areas and the infrastructure is something that also should be considered.

When doing business in Colombia, there are also future challenges which need to be addressed, like sustainability and food safety.

Hydroelectric can be challenging for Dutch companies only 0.8% of the Dutch energy comes from waterpower. In the other hand more than 70% of the energy of Colombia comes from hydroelectric.

The Dutch companies are used to deal with flat land and relatively small size spaces.

The main competition of the Dutch companies would be Germany, Spain and neighbors in South America companies which are also doing business in the water sector in the country.

The drug activity in the rural area and guerillas can jeopardize the progress of the projects.

The production of cocaine seriously affects the quality of the land and environment due to

chemicals being used for the production. This is explained by the EFFACE (European Union Action to Fight Environmental Crime) as following: ‘Sulfuric acid is used to soak the coca leaves and lime, kerosene, ammonia and other chemicals are used to make a base for the cocaine. Acetone, ether and hydrochloric acid are used to turn this base into cocaine, all of which leach into the soil and drain into rivers and streams.’ The high demand for cocaine in Europe, the USA and other regions, therefore, results in the degradation of land in Colombia. Within the drug activity also comes the corruption in the country and other illegal activities.



General Coca Cultivation Areas in Colombia

Figure 27 Coca cultivation area

CAGE

Cultural Distance

To compare Colombia and the Netherlands the cultural, administrative, geographic and economic distance regarding water management will be analysed. When looking at the cultural distance Hofstede's dimension can be used. Individualism is almost non-existent in Colombia meaning that there is no social safety net when people lose their job or get ill, thus the people of Colombia rely on their family. In contrast, the Dutch system encourages individualism due to a social safety net, health insurance and allowance when you lose your job. In this collectivist society, people belong in groups that take care of each other in exchange for loyalty. This means that when you work with Colombians you are not working with individuals but more with an interdependent group. This creates a different mindset that needs to be taken into consideration by the Dutch when working together with Colombians.

The Dutch system allows people to look at the long-term orientation. The Colombians, however, score very low on this point. Meaning that the Dutch could grab this opportunity to share their vision and the importance of a long-term vision, especially in the water management sector. The Colombians work 6 days a week of 8 hours. Most Colombians are Christians. The Colombians have a different time zone which is +7 hours compared to the Netherlands. Furthermore, Dutch people speak very frankly, they have a direct communication style which sometimes can be seen as impolite, but they view it as a form of openness. The Colombians prefer an indirect approach to communication.

Administrative distance

Both countries have similar ways of managing water which goes through the government department of infrastructure. Also, the projects are region and municipalities related meaning that the local government has a say in the projects in that area. When Dutch water companies are tendering for different projects they need to keep in mind that the Government of Colombia is their customer and need to adjust to their expectations to ensure that the project goes to the Dutch companies instead of any other competing water management firm.

Corruption in Colombia is deeper nestled in society than the Netherlands meaning that hiring a local agent to do your bargaining with the local municipalities is advisable. This way the Dutch companies can use the expertise of the local agent to get fast through certain bureaucratic constraints.

There is no political hostility among these two countries, quite the opposite. Due to facing similar problems related to water management the former Colombian president has asked the help of the Dutch after the floods of May 2015. This common problem results in a solid base for cooperation. In addition, there is also a trade agreement between the EU and Colombia and Peru. This agreement makes trading knowledge and products easier for Dutch water management companies.

Geographic distance

The climate is important to consider when talking about water management. Colombia is located close to the Equator which determines the country being characterized for its tropical and isothermal climate. The temperature prevails the same according to the region of the country. However, the seasons biggest difference is the amount of rainfall. The spring in Colombia is characterized by intense rainfall, unlike the winter season, the driest season. Summer is characterized by the increase of rainfall, although not very intense. In autumn the rain starts to decrease, although nature keeps its green colour throughout the year. Compared to a maritime climate in the Netherlands

The physical distance is almost 9,000 km from Bogota to Amsterdam. From a Dutch perspective, there is a time difference of +7 hours. The Kingdom of the Netherlands fits 27 times in Colombia and has no mountains. Both countries, however, share enough water resources and face the same challenges when it comes to flooding risks. Similarly, both countries have big ports where shipment from different continents arrives.

Economic distance

The Dutch GDP is 3 times higher than Colombia, however, GDP doesn't measure the informal economy which is quite big in Colombia. Colombian transportation cost is high due

to bad infrastructure. Both countries share a big budget regarding water management and Colombian labour cost is lower compared to the Netherlands.

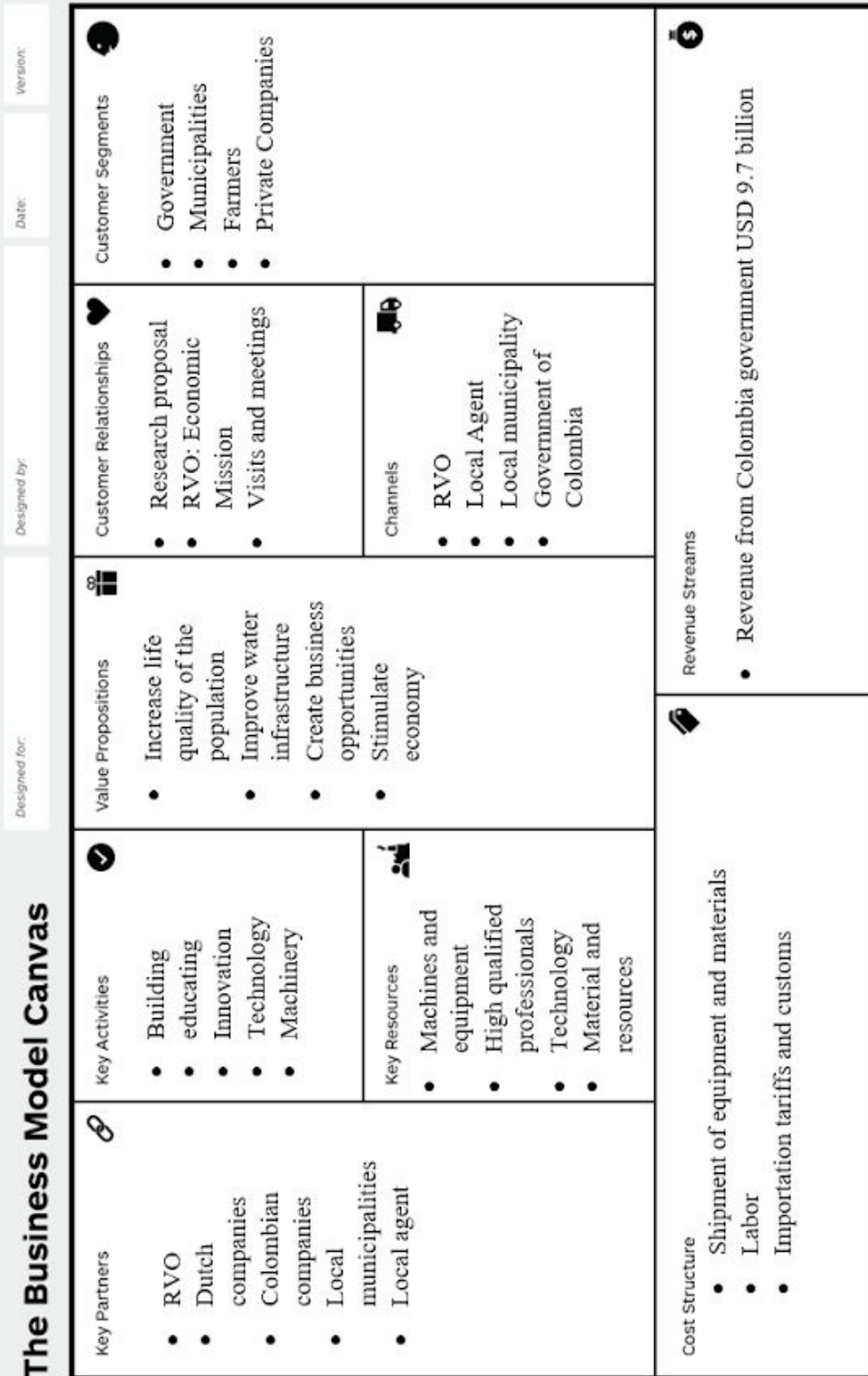
Cage Framework

Netherlands & Colombia	Cultural Distance	Administrative Distance	Geographic Distance	Economic Distance
Country Pairs (Bilateral)	<ul style="list-style-type: none"> • Dutch & Spanish • Individualism against collectivism • Long-term orientation versus quick results • Direct communication versus indirect communication • Modernism vs Traditionalism 	<ul style="list-style-type: none"> • Corruption integrated into all level of society • Involvement of drug traffickers in society • Colombian Peso, and the Euro € • Guerrilla groups 	<ul style="list-style-type: none"> • Physical distance (8,854 km) • +7 difference from the Netherlands • Tropical climate vs Maritime climate • Mountain vs flat country • Colombia is 27 times bigger • Weak infrastructure 	<ul style="list-style-type: none"> • Highest inequality of income LA, • Higher transportation cost • 3 times lower GDP than NL
Countries (Unilateral / Multilateral)	<ul style="list-style-type: none"> • European heritage 	<ul style="list-style-type: none"> • WTO, OECD, trade agreement with EU 	<ul style="list-style-type: none"> • Sufficient water resources 	<ul style="list-style-type: none"> • Sufficient budget for WM projects

- Shared Indulgence view
- Christianity as religion
- Democracy
- Government involvement
- Water management
- Similar sustainable goals
- Flooding-related issues
- Landlocks with big ports
- Co has a lower labour cost

Business Canvas Model

The Business Model Canvas



5 Forces of Porter

Supplier Power

The water sector in Colombia is composed by a large number of companies, like Acciona, Azud and WABAG (previously cited) that develop technological machinery and supply water treatment knowledge, therefore the bargaining power of suppliers is considerable low. There are several companies who provide the essential machinery for the sector, thus prices are usually standardized.

Buyer Power

The bargaining buying power in the water sector is low. Changing the way of operating the drainage system, for example, may include changing the entire machinery that they already disposed of. However, with similar prices on the market it is hard for the buyers to bargain for lower prices. To improve the bargaining power on the process the buyers can offer long term contracts or partnerships.

Competitive Rivalry

Threat among competitors in the water sector of Colombia is high. There is a big number of companies that already work in the sector worldwide and have good background knowledge, also with similar prices and quality. Although the costs of changing to another company are high, the long-term profits may change the whole scenario.

The Dutch company Eijkelkamp Soil and Water, is already working in Colombia and is well known for developing, producing and delivering solutions for soil and water sector. ChemTreat is another big company that work with industrial water treatment in North and South America.

Threat of Substitution

When talking about threats of substitutes in the water sector, what concerns the most is cheaper solutions. For example, in the water treatment sector, a company might offer a cheaper product for treating the water (for example chemicals), despite being more harmful to

human health. Dutch companies may have the most sustainable way of treatment; however, this comes at a certain price. Thus, it will be up to the Dutch companies to bargain price versus quality and long-term gains.

The threat of New Entry

Starting a company that it's able to compete in the water management market requires high upfront investments, owning licenses and insurances, and that makes the threat from new entrants low to medium. The experience that the popular companies already have is also a factor that affects the bargaining power of new entrants.

Non-Dutch Companies Developing Projects in Water Sector in Colombia	
WABAG (Austria)	Operation of drinking water and wastewater treatment
AGBAR (Spain)	Catchment, transport, treatment and distribution of drinking water
ACCIONA Agua (Spain)	Design, construct and operate drinking water treatment plants
Kurita (Japan)	Products, technology and maintenance services
Culligan Water (USA)	Treatment systems and local water quality
SENA (Canada)	Engineering, construction, environmental and infrastructure development
WATTS (USA)	Quality solutions for residential, industrial, municipal and commercial sectors
Earth Water Group (India)	Development, quality, conservation and environmental protection

Figure 28

Economic and Political Trends

It is of high importance to look at what is happening now and see what the trends are in the future when it comes down to doing business in Colombia. Is the way of doing business going to be the same or is it going to change in the future? Therefore, this is an important question to answer.

Colombia Water Treatment Equipment Production Data (USD Thousands)

Year	2015	2016	2017	2018 estimated
Total Local Production	32	32	34	35
Total Exports	22	511.3	515.5	22
Total Imports	452	23.6	24.0	470
Imports from the US	67	521.4	524.1	80
Total Market Size	461	477	479	483
Exchange Rates	COP 2,746	COP 3,053	COP 3,000	COP 3,000

Total market size = (Total local production + imports) - exports)

Units: \$ millions

Source: World Trade Atlas; industry sources

Figure 29 Water production

When looked at the graph above one can see important numbers concerning water treatment equipment production. For example, the total local production is going up what means that Colombia is putting effort in the production of water treatment equipment. Also, the total imports on water treatment equipment are rising tremendously which is a benefit for water facilities in Colombia. And last but not least the total market size is growing every year which indicates a rising importance from the Colombia on this matter.

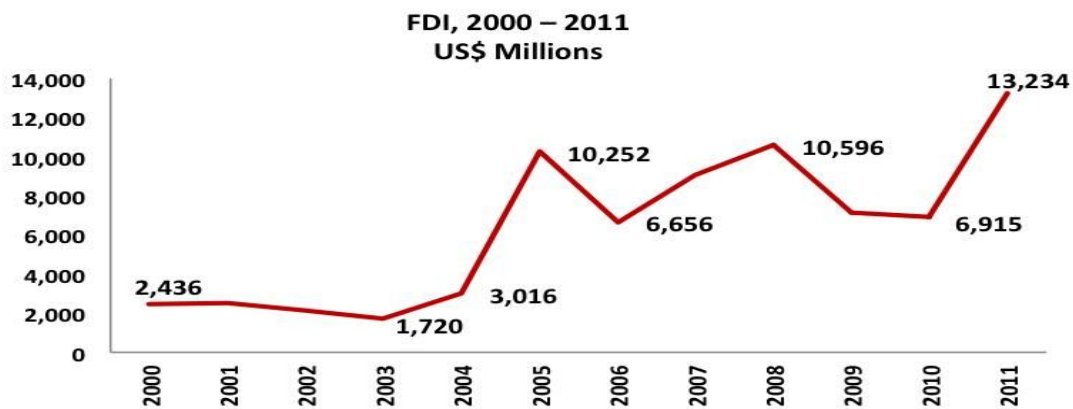


Figure 30: Foreign Direct investments

The government is also planning to invest 13 billion dollars in the aqueduct services and lacking sewers. Most of the money is coming from the government itself but there is also a financial injection from the private sector.

Not only these investments are done for restoring the water treatment in the country. The main focus areas for enforcement are water resource management and how to control it, treatment of water and wastewater, the supply of water and the handling of toxic waste collection and disposal.

These are mostly economic trends, but one must not forget the political changes to be able to enforce these actions. The ministry of Environment is improving the environmental regulations in the country and capacity building activities all over Colombia which will make a great difference for local inhabitants and foreign countries planning to invest in Colombia.

One must also not forget that Colombia has elected a new president this summer:

Iván Duque. The assignment for Mr. Duque as president is also going to have large impact on the country in a beneficial way. He is supporting a business-friendly climate in Colombia and planning to cut taxes and boost the investment in Colombia's economy.



Figure 31: President of Colombia, Iván Duque

He is also planning to tackle corruption and vowing for a peace agreement with the FARC which is also a great benefit for foreign companies.

The information above is especially for the public sector but there is also a private sector. Currently Colombia is involved in many deals concerning public-private partnerships. These partnerships have been adapted to the local culture. Colombia has a very innovative approach in this area and that also concerns contracting small entrepreneurs. Regional governments decide to join forces with the private sector, international shareholders and the municipality in order to come up with mutual policies including cross-subsidy programs. (OECD, 2009)

Forecast

With the early stages of reviewing the water system in Colombia, these trends support the necessity of investment by foreign businesses to invest in Colombia. One can predict that, because these trends are in their early stages, that the importance of these project will only grow over the next 5 years. Not only in an economical view but also the awareness around this subject in the political sector. In the economic sector one can foresee a great boost from the government and on political view Colombia is going to be a much more business friendly environment in the upcoming years.

There is one other project in progress in Colombia in the sector of water management supported by the RVO. This project is focused to solve the problem of water imbalances in the Andean region. It is important because the majority of the people lives here and most of the coffee sector (which is very important for Colombia) is based in this area. The project started in 2012 and the budget for the project is €20.500.000,-.

This is only one project, which means that there are many more opportunities to invest in Colombia, in the water management sector, in the future.



To enrich the economy of Colombia there are multiple projects which can be studied for future (foreign) investors. A few

projects on areas that Colombia has a urge to improve are listed down below.

- o Groundwater extraction expand aquifer system
- o Using little energy with highly efficient pumping
- o Install rainwater tanks in areas with suitable rainfall patterns
- o Recycle wastewater
- o Regular manutention of water equipment
- o Sewage treatment as an additional source of water
- o Use innovative technology to predict rainfall time scale and climate changes

- o Deploy satellite and airborne sensors for early detection of water pollution

Conclusion

Putting it all together, the most important findings are that Colombia differs as a country on all societal and businesswise matters. As well as internal problems like guerillas and drug trafficking, that don't occur in the Netherlands. Colombia is a country that provides challenges for Dutch companies. Despite these challenges it is a must to invest in Colombian water management. The demand for water management is rising, and the Colombian water sector lacks the knowledge that the Dutch companies have about this topic. However, there is also an adaptation required from the Dutch companies to the Colombian way of doing business. There are a lot of differences concerning the cooperation with the government and concerned external parties. Colombia is improving their constitution on environmental regulations and offers a booming market for foreign companies that want to invest in their country.

In addition, the Netherlands and Colombia depend on their ports and agricultural activities for their economic development and have an extensive river network and border largely to the sea. However, the biggest issue of the water sector in Colombia is the high degree of fragmentation, which made economies of scale difficult to realize. Besides being one of the richest countries in terms of water resources, Colombia hasn't been able to manage the economic water scarcity due to the lack of infrastructure. The demand is for an urgent plan that will improve the water supply by protecting the rivers that cross the cities and get polluted on the way. Furthermore, the lack of the infrastructure of the irrigation systems for agriculture. Therefore, they are also dependent on climatic conditions such as rainfall.

As Colombia is still climbing up the ladder of developing countries with stable annual growth in GDP the future of the country seems to head in the right direction. This growth will attract Dutch companies that specialize in dam relating problems. Other opportunities are also on the rise, for instance: The lack of infrastructure and planning of treatment for industrial, agricultural and domestic sewage leads to an intensive decrease of the usable water resources. Most of the sewage goes back to the rivers polluting the water. To be more specific in Medellin the Bello wastewater treatment plant only processes 25% of the municipality's sewage. The other 75% is flowing back into the river of Medellin, creating a threat to the environment. Solving these issues are crucial for increasing the growth of the economic prosperity of Colombia. The Dutch companies need to act and understand the Colombian culture in order to win tender offers provided by the Colombian government. Therefore, understanding the cultural difference is key and if they don't act accordingly then there are chances that are water management companies such as WABAW from Austria or Accion and Azud from Spain will take over.

Recommendation

With the Dutch expertise it is a must to invest in Colombian water management. The Colombian market for water is rising tremendously but they lack the ability to manage these investments properly. However, the Dutch companies need to learn how to adapt their way of business to Colombian cultural standards to be interesting to the Colombian market. As well one must not forget that starting these projects go through the government which could have an implemented form of corruption nestled in their system. On the other hand, the Colombian government is giving financial support to companies who work in this sector to improve the future of Colombia. Other opportunities like the lack of improvements in water treatment and distribution and nonetheless improving their constitution on environmental regulations offer a market for alien companies.

The threats the companies can face are working in another environment both geographically as culturally, drug activities/guerillas in the more rural areas and, last but not least, competition from other companies worldwide. The last threat is not entirely negative because it provides an indication that the market is indeed booming and with future improvements highly profitable. Colombia plans to invest USD 13 billion over the next 10 years in continuing improving the water sector

In a further investigation on this topic it is advisable for Dutch companies to inform with the Colombian government to receive more information on costs and potential financial benefits. Also, one must not forget to look into the Colombian culture and contact the multiple Colombian organizations who are intertwined in these projects to see what the requirements are to a successful investment.

Lastly, Dutch companies need to take the corruption factor of Colombia into consideration. Corruption is integrated into all the layers of society, thus hiring a local agent or law firm which had already dealt with such projects is recommended. There are many competitors from China, Germany and Brazil that are part of the tender offer. The Dutch companies must be aware of the fact that they are entering a market which has competitors from different countries. We would recommend that corruption needs further investigation to go more in

depth of the problem. Therefore, asking other Dutch companies that previously entered the Colombian market is highly advisable.

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This publication was commissioned by the ministry of Foreign Affairs

© Netherlands Enterprise Agency | November 2018
Publication number: RVO-187-1801/RP-INT

NL Enterprise Agency is a department of the Dutch ministry of Economic Affairs and Climate Policy that implements government policy for Agricultural, sustainability, innovation, and international business and cooperation. NL Enterprise Agency is the contact point for businesses, educational institutions and government bodies for information and advice, financing, networking and regulatory matters.

Netherlands Enterprise Agency is part of the ministry of Economic Affairs and Climate Policy.