



Report

Water Sector in Panama

Challenges and opportunities

Embassy of the Kingdom of the Netherlands in Panama | Embassy of the Kingdom of the Netherlands in Panama | Embassy of the Kingdom of the Netherlands in Panama

Summary

Panama’s water sector is facing various challenges. Basic drinking water and sanitation services are lacking in non-urban areas. Slightly more than half of the population in the rural areas have access to these services. In addition, water scarcity will reach alarming levels in coming years due to the growth and mobility of the population, economic development, international trade, urbanization, industry and climate change. Flooding events in Panama have increased dramatically in the last two decades. The five-year period from 2005-2010 was the period in which the most floods were registered in the country since 1930. Besides, the forest coverage in Panama has decreased significantly. This impacts the physical and chemical quality of freshwater. Finally, Panama is the country with the most water consumption per capita in Latin-America. A responsible culture towards water in all its facets is missing.

To counter these challenges, the Panamanian government created the “High Level Committee on Water Security”, who published The “National Water Security Plan”. The Plan is built on the knowledge of 19 institutions and contains a diagnosis

about the water resources situation. Furthermore, it foresees \$10 billion on projects until 2050. This creates opportunities for Dutch companies, since the Netherlands is a world leader in managing water, with 2000 active companies in the Dutch water sector. On top of that, several projects in Panama have been carried out successfully by Dutch companies in the past.

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I. Panama's water challenges

Panama and water are synonymous of each other. It is one of the top 5 countries with the highest precipitation in the world. The total volume of precipitation in the country is estimated at 233.8 billion m³ / year, estimating a national annual average of 2.924 l/ m², which is the highest value registered for Central America. More than 500 rivers naturally divide the territory in 52 watersheds, providing the country with a water supply of 119 billion m³. Besides being an abundant resource, water is also **crucial for the national economy**. The famous Panama Canal is an important pillar of international business, including commercial activities, logistics and financial services. With the expansion of the Canal, Panama's socioeconomic growth can continue to flourish. In addition, the agriculture, energy and tourism sector are directly linked with water resource management.

However, the future water abundance scenario has been questioned in recent years. The **pressure on water resources is increasing** due to population growth, economic development, urbanization and the effects of climate change. This is not the only concern for the Panamanian government regarding the water sector. The number of floods have been increasing drastically in recent years, leading to unrest among the local population. A lack of infrastructure is the main cause for these floods. Furthermore, access to drinking water and sanitation services are missing in large parts of the non-urban areas. Proper sustainable water management and water infrastructure is needed to solve and prevent these types of concerns in Panama.

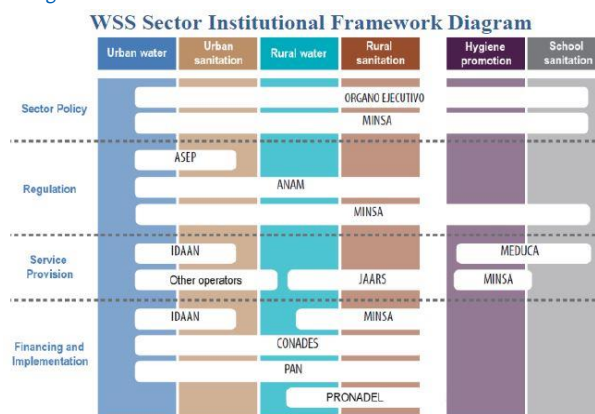
With this in mind, the Panamanian government created the "High Level Committee on Water Security", formed by several Ministries, the Panama Canal Authority and essential institutions. This committee was assigned to prepare a masterplan, which resulted in the publishing of the "**National Water Security Plan, 2015-2050 Water for All**". The Plan should be used as a guideline to make water improve people's quality of life, support inclusive socioeconomic goals and ensure the integrity of the environment. The Plan is built on the knowledge of 19 institutions and contains a diagnosis about the water resources situation in the country and the challenges faced in the short, medium and long term.¹

This report, written for the Dutch water sector, will be based on the **5 main goals of the National Water Security Plan**; (1) universal access to drinking water and sanitation services, (2) water for inclusive socioeconomic growth, (3) preventive risk management related to water, (4) healthy watersheds, and (5) water sustainability. Each goal will be elaborated in a separate chapter describing the current situation, the planned government actions and the business opportunities for the Netherlands. Furthermore, interesting short term projects from the National Water Security Plan are included in the appendix. The Netherlands being a world leader in managing water, with 2000 active companies in the Dutch water sector, could function as the **perfect partner** for the Panamanian water sector. No less than 40% of the freely accessible world market for water management is in Dutch hands.

II. Institutional Framework

This section of the report explains the institutional framework of the Panamanian water sector. Image 1 below demonstrates that the drinking water and sanitation sector exists of three government bodies which are responsible for policy and investment: (a) the Ministry of Health (MINSa), via the Directorate of Water and Sanitation (DISAPAS), which oversees sector planning and service delivery in towns and rural areas; (b) the National Aqueducts and Sewerage Institute (IDAAN), which is responsible for supplying drinking water in urban areas and rural communities with over 1,500 inhabitants; and (c) the National Authority for Public Services (ASEP) who supervises and regulates urban drink water provision.²

Image 1 Institutional Framework



¹ Gobierno Panama (2016) [Plan Nacional de Seguridad Hídrica](#)

² World Bank (2015). [Panama: Locking in Success, a Systematic Country Diagnostic](#).



Apart from the above-mentioned government bodies, the following government entities are also involved in water issues: the Ministry of Public Works (MOP), the Panama Canal Authority, Ministry of Environment (MiAmbiente), Ministry of Agriculture (MIDA) and the Ministry of Housing, Spatial Planning (MIVIOT) and Saneamiento de Panamá.³ When there are many players involved, it is important to define clear competencies as to avoid an overlap in responsibilities. This structure is clearly missing which makes **the water sector inefficient**. An important task for the Panamanian government to achieving its goals was therefore to strengthen the relationship between the different actors and where possible to **create one common (government) body** that makes the decisions about projects concerning the water sector. The solution to this is the “National Water Council” (**CONAGUA**) of Panama. It was created in 2016 to promote, guide, coordinate and guarantee the development and implementation of the National Water Security Plan. The CONAGUA is formed by different ministries and authorities and is presided by the Ministry of Environment.

Opportunities for the Netherlands

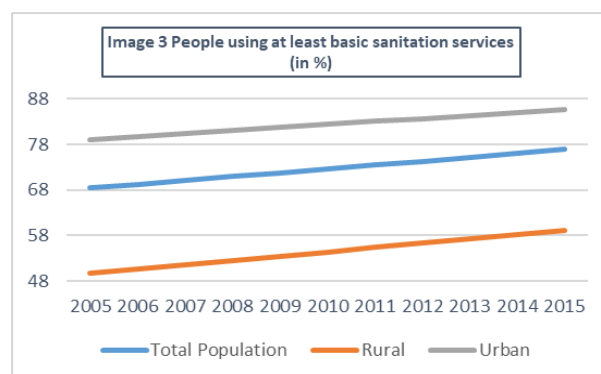
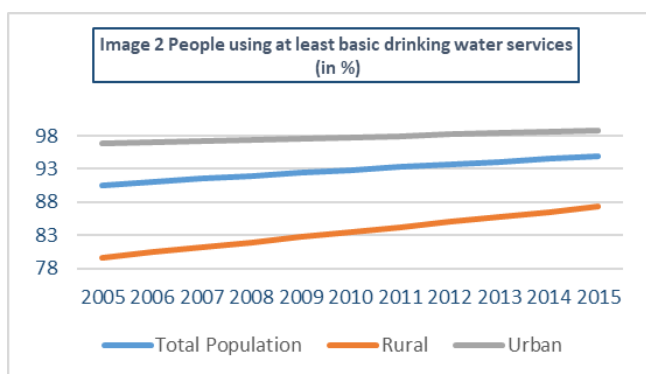
Improving the co-operation between the different government bodies could be an interesting opportunity for the Netherlands. During a previous mission to the Netherlands, the Dutch ‘**polder model**’ was presented as a possible solution. This model focuses on the reduction of interdepartmental competition and it provides the entities a platform to take on responsibilities.⁴ Although the creation of CONAGUA is a step in the right direction, it mainly focuses on upholding the National Water Security Plan.

III. Drinking water and sanitation services

As written in the introduction, the National Water Security Plan is based on five different main goals. The first goal is to have **universal access to quality drinking water and sanitation services**. The purpose of this goal is to ensure that every person can have a decent, clean, healthy and productive life. According to the World Bank, *quality* drinking water sources “include piped water, boreholes or tube wells, protected dug wells, protected springs, and packaged or delivered water. In addition, *quality* sanitation services include flush/pour flush to piped sewer systems, septic tanks or pit latrines; ventilated improved pit latrines, composting toilets or pit latrines with slabs.”⁵

Overview drinking water and sanitation services

Being one of the most prosperous and developed countries in Central America, Panama should be seen as a **leader in sanitation and water quality**. However, there have been many challenges in recent years pertaining to water quality, especially in rural areas.⁶ Image 2 depicts the amount of people using at least basic drinking water services for the period 2005-2015.⁷ The figure shows that more than 90% of the total population has access to basic drinking water services. However, there is **much to be gained in the rural areas**. Although improvements have taken place, the access to at least basic drinking water services in rural areas is below 90%. An example of poor living conditions in the rural area, is the province of Wargandí. In 2010, only 15.3% of the people in this province had access to drinking water.⁸



³ Embassy (2016). Regional Opportunity Dutch Water Sector

⁴ Ibid.

⁵ World Development Indicators, World Bank

⁶ [The Borgen Project \(2017\)](#)

⁷ Note: the figures provide us with information about access to *basic* drinking water and sanitation services, instead of *quality* services

⁸ Gobierno Panama (2016) [Plan Nacional de Seguridad Hídrica](#)

The same pattern is visible when looking at the sanitation services in the country. Image 3 illustrates the amount of people using at least basic sanitation services in this similar timeframe. Again, basic services are less accessible in rural areas and compared to the urban area the difference is even greater. It is therefore no surprise that the government will mainly **focus on improving water and sanitation services in non-urban areas**.

Government actions: increasing basic services

As written in the 'National Water Security Plan', the achievement of the goal implies the execution of **4 concrete actions**; (1) improve the efficiency of the current services, (2) increase the coverage of drinking water services, (3) increase of sanitation services, and (4) the planning for water and sanitation systems nationwide.⁹

As part of the action to improve the efficiency of current services, a Spanish company was awarded a contract for the assistance and technical advice for operational and commercial management of IDAAN. The company will carry out a business plan, an aqueduct master plan for the metropolitan area of Panama, a process reengineering plan and personnel training based on a five-year contract.¹⁰

For the other mentioned actions, the government has launched plans that contain construction work. Examples are the construction of water treatment plants and wells, aqueducts, pipelines and supply systems. These projects mainly focus on the development and expansion of the current network.

With these construction works, the Panamanian government, among others, wants to tackle a **persistent problem** in the water sector: the loss of produced drinking water as non-accountable water. Leakages in the distribution network are the main reason for this, however illegal connections and the lack of metering possibly also play their part.¹¹ Possible causes of the leakages are lack of maintenance and limited understanding of the ground conditions in the new infills. **In Panama, 42% of the drinking water is wasted or misused.** This percentage is higher than the average in developing countries (40%) and almost three times higher than the average in developed countries (15%).¹² These numbers indicate that the efficiency improvement of the current services seem to be the most crucial action in achieving the main goal; universal access to drinking water and sanitation services.

⁹ Gobierno Panama (2016). [Plan Nacional de Seguridad Hídrica](#)

¹⁰ [La Estrella \(2018\)](#)

¹¹ Embassy (2016). Regional Opportunity Dutch Water Sector

In July 2018, the government of President Varela admitted that their goal to have 100% drinking water and zero latrines cannot be fulfilled before the end of the government term in 2019. For eliminating all latrines in the country, the concrete goal was to build at least 300 thousand hygienic bathrooms. Jorge Gonzalez, the Secretary of Presidential Goals, recognized that only between 70% and 80% of this goal would be achieved. The drinking water projects are already in execution, however, the initial processes took more time than expected.¹³

Opportunities for the Netherlands

In relation to each main goal, the government has decided to schedule different investment projects on the short- (2015-2020), medium- (2021-2030), and long-term (2031-2050). In the appendix, the most interesting tenders for Dutch companies on the short term are provided.

Next to the tenders of investment projects, **fighting the mentioned spilling of drinking water** could be an interesting opportunity for the Netherlands. First of all, the Dutch consulting sector could play a role in determining how potential water savings can be achieved through a reduction program. District Metered Area (DMA) is a well-known method which has been used worldwide for discovering water leakages. This method proactively finds the leaks before they appear at the surface. A Dutch drinking water company has been using this method in recent years and might give advice regarding this solution.¹⁴

Image 4 Smart Water Network



¹² CATHALAC (2016). Visión del agua en Panamá (PPT)

¹³ [Panamá América \(2018\)](#)

¹⁴ [Oasen Drinkwater \(2015\)](#)

Following this, **smart water grid management** is an opportunity for Dutch companies specialized in this area. The goal of this management is to create a smart water network (image 4): “an integrated set of products, solutions and systems that enable utilities to remotely and continuously monitor and diagnose problems, prioritize and manage maintenance issues and use data to optimize all aspects of the water distribution network.”¹⁵ There are plenty of companies in the Netherlands which are specialized in this type of management.

Another possible opportunity could arise from a World Bank project with a total value of \$80 million. This project has been set up as support for the “National Indigenous Peoples Development Plan” and it includes the **improvement of quality and cultural pertinence of service provision in the health, education, water and sanitation sectors in indigenous territories**.¹⁶ Providing these water and/or sanitation services, are an opportunity for Dutch companies.

An example of recent Dutch success regarding the supply of basic water services is a water purification project in Boquete. A Dutch company is currently involved in the execution of this project.

IV. Water for inclusive socioeconomic growth

The second goal of the Panamanian government is to obtain inclusive socioeconomic growth using water. The purpose of this main goal is to **ensure water for all productive sectors of the economy**; such as agriculture, industry, energy, transport, tourism and biodiversity.¹⁷ Although there is sufficient fresh water available in current years, models show that water scarcity will reach alarming levels in coming years. The phenomenon of “El Niño” is one of the main reasons why there are still periods of drought in Panama. “El Niño refers to abnormal warming of surface waters in the tropical sections of the Pacific Ocean every three to five years. This can have wide-ranging impacts on the regional climate.”¹⁸

This water scarcity will also have negative consequences for the Panama Canal and therefore the entire Panamanian economy.

¹⁵ Sensus

¹⁶ World Bank (2018)

¹⁷ Gobierno Panama (2016). [Plan Nacional de Seguridad Hídrica](#)

¹⁸ Phys (2015)

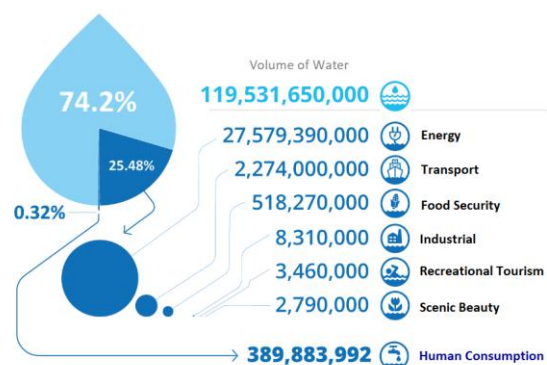
¹⁹ Panama Canal

The Canal’s first mandate is to supply water for human consumption. Right now, it provides water to 55% of the country’s population. Its second mandate is to have enough water volume for other uses, like transportation.¹⁹ “Climate change-induced weather extremes could lead to costly slow-downs that would actually make the Canal a less-efficient shipping route and cause a ripple of delays.”²⁰ The administrator of the Panama Canal Authority (ACP), Jorge Quijano, affirms that the **ACP is concerned about guaranteeing water for human and industrial consumption**. “If we continue to grow and use the same water source, we will not have enough to supply everyone”.²¹ For this reason, the ACP is investigating two alternatives to expand the drinking water sources: Rio Bayano and Rio Indio. Analysis of prefeasibility and feasibility are executed to determine the potential of these rivers for the production of drinking water.²²

Overview of fresh water availability in Panama

In Panama, the total availability of fresh water has been estimated at 119.5 billion m³, of which approximately 25.8% is used. However, estimates for the year 2050 predict that almost 20% more of the available fresh water will be used. This **expected increase in demand for fresh water** is due to the growth and mobility of the population, economic development, international trade, urbanization, industry and climate change. The greatest demand for fresh water is concentrated in the Pacific slope where 83% of the population lives and where more than 70% of the economic activities are taking place.²³

Image 5 Volume of water used in Panama



²⁰ The Guardian (2014)

²¹ La Estrella (2015)

²² Canal Panama (2016)

²³ Gobierno Panama (2016) [Plan Nacional de Seguridad Hídrica](#)

But for which activities are the available water resources used? Image 5 displays the volume of water used in Panama per sector. The image illustrates that a **great amount of the total available water resource is used by the hydroelectric sector (23%)**, followed by the transport sector (1.9%). Almost all these uses can be classified as non-consumptive, meaning that the water remains in or is immediately returned to the location in a stream or aquifer from which it was extracted.²⁴

Regarding the infrastructure for the use of water: it includes 60 water treatment plants, 5397 rural aqueduct systems, 783 irrigation systems (public and private), 1 wastewater treatment plant, 45 hydroelectric projects, and 263 hydro meteorological stations for water resource monitoring. Like said, the scope of the water resource has to be increased to meet the future demand. The construction and maintenance of the infrastructure is therefore essential.

Government actions: fresh water management

The implementation of the following **three government actions** should lead to the accomplishment of the goal; (1) the management of water resource availability, (2) fresh water demand management, and (3) the increase in fresh water availability.²⁵ In total, 49 projects have been identified to be carried out. The projects proposed under the first line of action are of permanent execution, but more importantly they also include investments for new studies and improve monitoring capacities of water resources. The water demand management will be improved through the adoption of new technologies and more efficient water use systems. Finally, the increase in fresh water availability should be accomplished by means of constructing multi-purpose water reservoirs.

Opportunities for the Netherlands

Short term projects which are interesting for the Netherlands include the estimation of water availability of priority river basins, and the **construction of multipurpose water reservoirs** in the mentioned Rio Bayano and Rio Indio as well as in Santa Maria. Comparable with Panama, there are planned projects in the Netherlands which should secure fresh water supplies. In the so-called “Delta Program”, the extension of a water reservoir in the “IJsselmeer” region is discussed.²⁶ “The IJsselmeer area

comprises lakes IJsselmeer, Markermeer, IJmeer and Randmeren. It is the **largest freshwater basin in Western Europe** and functions as a buffer which, during periods of drought, can supply water to many parts of the Netherlands.”²⁷ The knowledge that has been used for this area could be valuable for the projects in Panama.

Moreover, the Netherlands is one of the front-runners in **water catchment**. A catchment is an area where water is collected by the natural landscape. Subsequently, this collected water is used to supply water for our needs by constructing dams and weirs or tapping into groundwater.²⁸

V. Risk management related to water

It is not surprising that preventing water related risks is one of the main goals of the Panamanian government. The extremely high amounts of precipitation in the country lead to **flooding** in different parts. At the same time, periods of **drought** induce water shortages. Climate change predictions suggest that these extreme events may even become more frequent and more serious. Since the Netherlands is a country that is partly below sea level, flood prevention is part of the culture. The main focus of this section will therefore be the prevention of flooding.

Overview current situation

As we can see in image 6, the number of **flooding events in Panama have increased dramatically** in the last two decades.²⁹ Where the number of floods did not exceed 5 at the beginning of the nineties, a high point of more than 60 floods was reached in 2007. On top of this, the figure only depicts the floods in 5 cities (Panama, San Miguelito, Santiago, David and Colón) and therefore does not take into account other affected areas outside of these cities.³⁰

“The inland districts of Juan Díaz, Tocumen and Pacora located in the mid-section of these rivers have been increasingly prone to flooding; between 1990 and 2009 a total of 45,983 people and 9,847 homes were affected. In the district of Juan Díaz, 305 flood events were recorded between 1990 and 2015. Flooding has the most impact here because it is the most densely populated of the three districts.”³¹

²⁴ [Maven's Notebook \(2013\)](#)

²⁵ Gobierno Panama (2016) [Plan Nacional de Seguridad Hídrica](#)

²⁶ [Climate Change Post](#)

²⁷ Rijkswaterstaat (2011) [Water Management in the Netherlands](#)

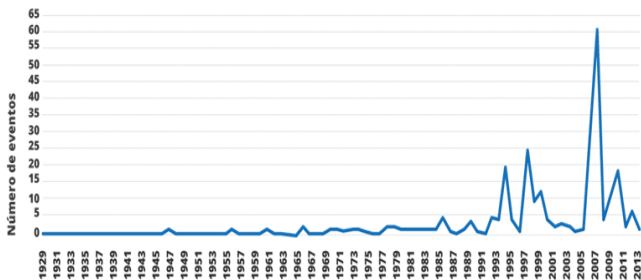
²⁸ [WaterNSW](#)

²⁹ [Conagua](#)

³⁰ [TVN Noticias \(2017\)](#)

³¹ [DRR-Team Mission Report \(2015\)](#)

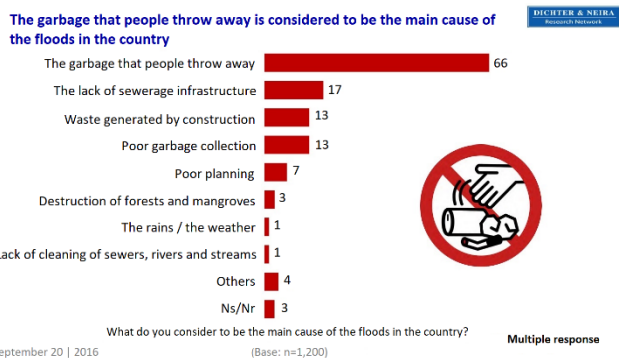
Image 6 Number of floods in 5 cities of Panama, 1929-2013



Looking at the number of floods throughout the whole country, the five-year period from 2005-2010 was the period in which the most floods were registered in the country since 1930.³²

Although extreme rainfall in Panama is certainly one of the causes of the many floods, this does not seem to be the main cause. First of all, the **water infrastructure in Panama is extremely poor**. According to Emilio Sempris, Minister of Environment, it is not a secret that the storm drains in Panama have been placed for 50 years and never been modernized. For this reason, the water has difficulty running and causes flooding. Added to the lack of maintenance of storm drains, the **lack of education is another culprit**. It is not uncommon that people are improperly throwing garbage into the rivers.³³ Fortunately, it looks like this attitude is changing; in a survey conducted by Dichter and Neira (see image 7), 66% of the respondents answered that the garbage that people throw away is the main cause of the floods in Panama.³⁴ Remarkable is the fact that only 17% of the respondents blame the lack of sewerage infrastructure while only 1% blames the weather conditions for being the main cause of floods.

Image 7 Survey about main cause of floods in Panama



Government actions: preventive risk management

The government actions mentioned in the 'National Water Security Plan' are focused more on preventing future floods instead of solving the current situation. This is based on **two general actions**: (1) preventive risk management and (2) monitoring or early warning of risk. Examples of measures which directly deal with risks related from water are: the dredging and canalization of rivers, open and underground drainage of rivers and early warning systems for floods and landslides in watersheds. Although preventing future risks is fairly important and eventually leads to the limitation of flooding, it does not provide a solution for the current issues.³⁵

DRR Team scope mission to Panama

One of the measures implemented to tackle the current issues was the **Dutch Risk Reduction (DRR) Team** scope mission to Panama in April 2015. By invitation of the Municipality of Panama, the Dutch Embassy in Panama brought together a DRR team of 3 experts to carry out the mission. The main objectives were to **scan the challenges** in relation to flood risk in the Juan Diaz watershed, **share Dutch knowledge** and **identify opportunities** to improve cooperation. Many challenges were discovered during the mission on content, institutional and relational level. Important causes were a lack of understanding of data and principles, a lack of cooperation between institutions and a lack of investments. During the mission a series of **recommendations and follow-up actions** were discussed based on immediate, short term, mid-term and long-term measures. According to the DRR Team, concepts of Dutch water management can be introduced directly in Panama by experts from this sector. For this a broad and continuing exchange of knowledge and experience is required. This ultimately led to the "Water Dialogues" project.

Water Dialogues

The so-called "Water Dialogues" is a project set up as follow-up to the DRR Team scope mission. The project is a collaboration of the Municipality of Panama, the Dutch government and the NGO Wetlands International, to **reduce the risk of flooding in Juan Díaz, Tocumen and Pacora**. The most relevant results of the Water Dialogues until now are as follows:

³² Panamá América (2018)

³³ Panamá América (2018)

³⁴ TVN Noticias (2016)

³⁵ Gobierno Panama (2016) [Plan Nacional de Seguridad Hídrica](#)

- “Evaluation of the actual drainage system, planned developments, and coordination of the water management activities of the different authorities
- A hydrological study (financed by IDB and executed by IH Cantabria) that showed the impact of the landfills on flooding of neighborhoods
- Community action to clean-up the drainage system
- Action plan for regulatory adjustments, including a Risk Zone Map and additional building requirements to prevent inadequate construction in flood risk zones”³⁶

Partly because of the results from the Water Dialogues, in May 2018, a tender was carried out with the goal to improve and expand the width of the Juan Díaz river. The **tender had a total value of \$6.5 million** and arose from the studies conducted.³⁷ However, the Center for Environmental Impact Panama (CIAM) filed a claim on behalf of community activists from the Juan Díaz district. According to them, the planned construction work on the protected “Bahía de Panama” is an illegal activity. Additionally, the works that would be contracted with the tender are not supported by any previous study; they even contradict technical recommendations made by water specialists.³⁸

Opportunities for the Netherlands

The mentioned DRR Team scope mission and the Water Dialogues are great examples of opportunities for the Netherlands in preventing risks related to water. The knowledge of Dutch experts in this area has proven to be valuable in Panama. At the end of 2018, a **third mission** with respect to the Water Dialogues will take place in Panama. Furthermore, the ongoing tender regarding the Juan Díaz river remains an interesting business opportunity. Recently, it was announced that the Municipality of Panama will receive a **loan of \$80 million** from the Inter-American Development Bank (IDB) to implement integral solutions in the Juan Díaz watershed. The fact that Dutch experts worked on this project might be an advantage for Dutch companies willing to apply.

Another opportunity for the Netherlands in this field is the **Tocumen district**. Because of the construction of a new runway and terminal the risk of floods increased. The more buildings are constructed, the less water can be retained by vegetation. This ultimately leads to overflowing rivers and flooding. **The World**

Bank is continuing the Water Dialogues model to solve the issues in the Tocumen area with a multi-million project. Given the experience with this model there is great potential for Dutch contribution. As currently planned, a Dutch company will research the watershed and write a proposal with solutions for the expected problems.

In addition, the World Bank is developing a plan to strengthen urban resilience in Panama City. One of the objectives is to **promote the mitigation of existing and future flood risks of the urban settlements**. The consultancy plan exists of three segments: (1) Amador to Marbella, (2) Punta Paitilla to Punta del Este and (3) Humedal to Reserva de Residuos. Within these segments, it is investigated where the chances of future floods are the greatest. Another objective of the plan is to introduce improvements in urban infrastructure and to create a coastal access. Comparable projects were executed by a Dutch company near the residential area of Punta Pacifica in Panama City. The company has constructed two artificial islands in the Pacific Ocean (see image 8) in 2013 and 2015. To connect both islands, a bridge has been built by the same company.³⁹

Image 8 Artificial Islands built by a Dutch company



Next to the Juan Díaz and Tocumen projects, future opportunities could arise in the **city of Colón**. The number of floods in this city are comparable to those in the discussed districts. The Embassy is working with the Municipality to identify the issues and measures which are needed to overcome those. Dutch companies could play their part in new projects.

In the Netherlands, a “paradigm shift” has taken place in the approach to flood management. Instead of confining rivers and building and strengthening the dikes, the rivers are literally given more space.⁴⁰ “The goal of this Dutch **“Room for the River”**

³⁶ [Wetlands International \(2017\)](#)

³⁷ [El Capital Financiero \(2018\)](#)

³⁸ [La Estrella \(2018\)](#)

³⁹ [Boskalis \(2015\)](#)

⁴⁰ [PRI \(2017\)](#)

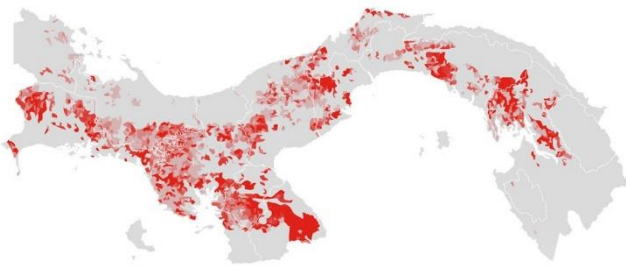
program is to give the river more room to be able to manage higher water levels.”⁴¹

In addition, cities use parks and public spaces as emergency reservoirs for floodwater. An example is the “Benthemplein” in Rotterdam. Implementing these types of Dutch invention in Panama could be seen as another opportunity for the Netherlands.

VI. Healthy Watersheds

Forests play an important role in providing clean water. In addition, forests also absorb rainfall, refill groundwater aquifers, slow and filter storm water runoff, reduce floods and maintain watershed stability and resilience.⁴² To ensure sufficient water availability in the future, it is crucial to have healthy watersheds. The protection of these water sources is an essential component of water security for all uses. The fourth goal which has been proposed in the National Water Security Plan is therefore to have an **adequate planning of the use, restoration and conservation of watersheds**.

Image 9 Loss of Forest Cover in Panama



Overview current situation

Since its independence in 1903, **the coverage of forest in Panama has decreased significantly**. This impacts the physical and chemical quality of freshwater. Image 9 shows that the coverage of forest decreased in almost half of the country. In 2012, it was determined that 40.4% of Panama’s territory was covered with forest. This number already decreased to 39.8% in 2014; this means that with this current trend, Panama would only have 30.6% of its territory covered with forest in 2038 (see image

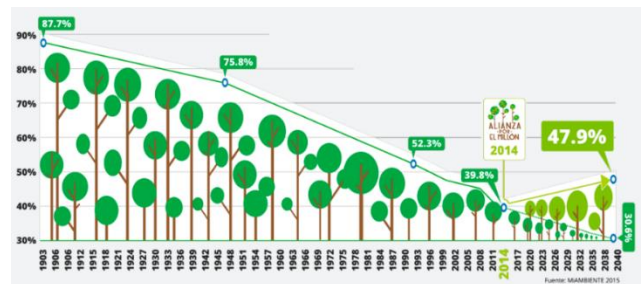
⁴¹ [Ruimte voor de rivier](#)

⁴² [Southern Foresters \(2014\)](#)

⁴³ [Panama Canal](#)

10). To reverse the current trend, the Panamanian government has initiated a **public private partnership**. The goal of this initiative is to restore forests in watersheds and to contribute to the rural economy, conservation of water resources and ecotourism.

Image 10 The loss of Forest Cover 1903-2014 and expected recovery projection to 2040



Besides deforestation, another risk factor for the availability of water and the conservation of healthy watersheds is the **contamination of the surface and underground sources**. There are 63 landfill sites with direct and indirect impact on the banks of waterways, mangroves and coastal areas. In 2015, an agreement between MiAmbiente, MINSA and IDAAN was executed with the intention to monitor the water quality for human consumption at 3.383 different points in Panama. Finally, **urban growth** is another aspect which violates the water supply sources available. Interesting to mention is that the **Panama Canal has its own watershed**, which is under the management of the Panama Canal Authority. Their mission is to administer and conserve Canal water resources, participate actively in the protection of the environment and the sustainable development of the Canal watershed.⁴³

Government actions: watershed management

Next to the watershed restoration and the reduction of contamination, the Panamanian government will focus on **two main actions** to protect the watersheds and ensure water availability; (1) integrated watershed management and (2) strengthening of water quality monitoring. The first action includes management plans for the sustainable use of land, like sustainable farms.⁴⁴

⁴⁴ Gobierno Panama (2016) [Plan Nacional de Seguridad Hídrica](#)

Opportunities for the Netherlands

The opportunities for the Netherlands related with watershed management are promising. In cooperation with the Panamanian government, a Dutch company is working on a project to **improve the water quality** in the Canal zone. This process can be seen as part of the second government action; strengthening of water quality monitoring.

Next to this, the Dutch program “**Building with Nature**” could be used as an example for future projects in Panama. The program has been set up to fight the increased pressure on coastal ecosystems, caused by population growth and rising sea levels. By doing this, natural processes are deployed as building blocks to solve ecological problems.⁴⁵ Examples of interesting Building with Nature projects for Panama are projects with the objective to **counter erosion and to recover mangroves**. This know-how can be very useful in a country where deforestation has increased dramatically.

VII. Water sustainability

The final challenge of the Panamanian government is related to water sustainability. Creating a responsible culture towards water in all its facets is a key factor for improving its sustainability. **Mechanisms of coordination, negotiation, information, education, and training** are necessary aspects in raising awareness of users about a public good that is indispensable for all human activities and the development of a country.

Overview current situation

As described, an educated society is crucial for improving water sustainability. However, it is impossible to educate society if an **effective inter-institutional coordination is lacking**. Institutions need to have the technical, operational, logistical and financial capacities to exercise their mandate. Given that water is essential for the development of various human activities, many institutions are involved at different levels of government, both national and local. Collective will between these institutions in the Panamanian water sector is required to make structural adjustments.

Why are these structural adjustments needed in Panama? First of all, a **responsible culture with respect to waste is completely missing**. As discussed, this affects the water sector directly by

increasing the risk of flooding rivers. Furthermore, trash is damaging sanitation services in Panama-City which makes the maintenance more expensive. Above all, waste is destroying the water quality and makes it non-usable for human activities. The purification process takes longer and is more expensive. For this reason, sustainable water supply is harder to achieve.

However, the greatest gain can be achieved by **reducing water consumption**. Panama is the country with the highest water consumption per capita in Latin-America.⁴⁶ The average water consumption in Panama is around 400 liters per day per person, which is 8 times the required WHO standard. This is almost **4 times the daily consumption of the Dutch average**.

It is clear that a program on water saving should be implemented. Together with the fact that 42% of the drinking water is wasted or misused because of leakages (chapter 3), Panama is performing like a developing country regarding water sustainability.

Government actions: institutional strengthening

The government has pronounced **four concrete actions** to improve water sustainability: (1) agreement on water, (2) updating the regulations, (3) institutional strengthening, and (4) education and research on the sustainable use of water. The first action has the objective to resolve conflicts over access to water and to prevent future conflicts in a participatory manner. Updating regulations is needed, because some have become obsolete in relation to the evolution of the country. Institutional strengthening includes the strengthening of human resource capacities through training and the use of higher quality equipment. The final action of education is focused on training professionals in the field of water, which should have an impact on the knowledge of the whole society.⁴⁷

Opportunities for the Netherlands

The Dutch **consultancy sector** could play a role in improving the water sustainability conditions in Panama. As the average water consumption in Panama is four times higher than in the Netherlands, it is reasonable to argue that Dutch experts could help with creating a water saving program.

⁴⁵ [Wageningen University \(WUR\)](#)

⁴⁶ [La Estrella \(2013\)](#)

⁴⁷ Gobierno Panama (2016) [Plan Nacional de Seguridad Hídrica](#)

VIII. Appendix

Goal 1: Universal Access to water and sanitation services					
Project #	Institution	Investment (2015-2020)	Executed/ tendered	Budget 2017-2018	Pending
#347: Execution of the Sanitary Sewage Masterplan of Panama City and San Miguelito (includes designs, construction and inspection)	Saneamiento de la Bahia	\$366 million	\$366 million	-	\$955 million
#407: Master plan Sanitary Sewage – La Chorrera	Saneamiento de la Bahia	\$ 4.95 million		P.D.	0
#408: Updating the National Drinking Water and Sanitation Master Plan	IDAAN	\$ 3.10 million		P.D.	0

Goal 2: Water for inclusive socioeconomic growth					
Project #	Institution	Investment (2015-2020)	Executed/ tendered	Budget 2017-2018	Pending (medium/long)
# 1 Estimation of water availability (supply and demand) of priority river basins	MIAMBIENTE	\$200,000.00	\$200,000.00	-	\$3 million
# 2 Study of estimation of environmental flow in watersheds	MIAMBIENTE	\$100,000.00	-	P.D.	\$3 million
# 3 Surveillance of flows and hydro-meteorological variables in the Panama Canal basin - includes equipment	ACP	\$10 million	-	P.D.	\$65 million
# 6 Groundwater survey and mapping at the national level. Includes methodology development	MIAMBIENTE	\$5 million	-	P.D.	0
# 7 Water Quality Monitoring in the Canal Watershed and Tributary Rivers	ACP	\$9.7 million	\$9.7 million	-	\$100 million
# 20 Modernization of Irrigation Systems with Increased Irrigation Efficiency	MIDA	\$1.5 million	-	P.D.	\$3 million
# 23 Technological innovation and technology transfer in the reutilization of wastewater	MIDA/MIAMBIENTE/SENACYT	\$300,000.00	-	P.D.	\$1 million
# 24 Solar and wind pumps for new wells	IDAAN	\$3 million	-	P.D.	\$40 million
# 39 Study and construction of multipurpose water reservoir in Rio Indio for water supply of Panama city	Inter-institutional	\$133 million	-	P.D.	\$367 million
# 40 Study and construction of multipurpose water reservoir in Santa Maria river for water supply of 'Dry Arch' region	Inter-institutional	\$61 million	-	P.D.	\$141 million
# 41 Strategic environmental assessment for intervention zones of new reservoirs	MIAMBIENTE	\$700,000.00	-	P.D.	0
# 42 Elaboration of environmental, socioeconomic and hydrological studies, design and construction of multipurpose reservoir in basins with water potential	MIDA, MIAMBIENTE	\$3 million	\$1 million	\$1 million	\$250 million
# 48 Studies to define alternatives / improvements of multipurpose utilization of water stored in existing lakes.	Inter-institutional	\$1 million	-	P.D.	\$40,000
# 49 Multipurpose use of water stored in existing lakes.	Inter-institutional	\$2 million	-	P.D.	0

Goal 3: Preventive management of risks related to water

Project #	Institution	Investment (2015-2020)	Executed/tended	Budget 2017-2018	Pending (medium/long)
# 5 Identification and implementation of adaptation measures to the impacts of climate change on water and watersheds	MIAMBIENTE	\$5 million	-	P.D.	0

Goal 4: Healthy Watersheds

Project #	Institution	Investment (2015-2020)	Executed/tended	Budget 2017-2018	Pending (medium/long)
# 4 Integrated management of basins in the Canal Basin (community participation, environmental monitoring and evaluation, reforestation and restoration programs, environmental economic incentives, among others).	N/A	\$6.5 million	\$6.5 million	-	\$37 million
# 5 Implementation of watershed conservation projects. Soil and water conservation, watershed committees, management plans and inter-institutional coordination	MIAMBIENTE	\$4.5 million	\$1.5 million	\$3 million	\$90 million
# 26 Strategy - Reduction of the use of agro-chemicals	MIDA	\$4.1 million	\$1 million	\$3.1 million	\$10.8 million

Goal 5: Water Sustainability

Project #	Institution	Investment (2015-2020)	Executed/tended	Budget 2017-2018	Pending (medium/long)
Most short-term projects are already being implemented					
# 40 Strategy for water consumption reduction and protection of rivers and creeks	Saneamiento de la Bahia	\$2.2 million	-	\$2.2 million	0

More information

For more information and questions about specific projects or developments mentioned in this report, contact the embassy at pan-ea@minbuza.nl.

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