

GROUNDWATER IN FAST GROWING CITIES IN WESTERN AFRICA



LEGEND CITY PROFILES

General information	Management
Public water supply	Wellfield monitoring
Alternative water supply	General monitoring
	Protection zones
	Borehole licensing
	Yes
	No
	Not applicable / No data

LAGOS - Nigeria

Population city: 11,847,633 (6% of country)
Population growth: 38.9% (2000 - 2015)

Climate: Tropical savanna climate with dry-winter characteristics

Hydrogeology: Lagos is located in the Coastal Sedimentary Basin, which stretches from Ghana to Nigeria. There are two main aquifers in use: the Continental-Terminal (or Mio-Pliocene) aquifer and the shallow Quaternary deposits. In the rest of the Lagos State, the deeper Cretaceous aquifer is also exploited and might also be exploited in Lagos in the years to come.

Water supply: It is estimated that only 20% to 25% of the population has access to public water supply, either through a private tap or a public fountain. Public water supply comes from several treatment plants on the Ogun and Owo Rivers as well as Aye River near Ibeju. Most of the residents without access to public water supply rely on domestic boreholes and hand-dug wells. A large proportion of residents also buy water from private sellers.

Groundwater use in the rest of the country: Groundwater is a major source of water supply throughout the country.

Groundwater issues and impacts: There are evidences of contamination by bacteria and heavy metals in wells, water sold in bags and public water where cracks in the pipes allow wastewater to leak in. Groundwater contamination is a major issue in Lagos State. Major pollutants include salt water and oil products.

Water demand strategy: The Lagos Water Corporation had a Master Plan, foreseeing the building of new water treatment plants, a monitoring station and new pipelines by 2020. None of these objectives was achieved.

Water supply: About 56% of the residents have access to public water supply, either via a private tap (80%) or a public fountain (20%). The network is supplied with groundwater from the semi-confined sandstone aquifer, tapped by 77 boreholes across the Great Banjul Area although only 70 are operational. It is estimated that 20% of the population rely on domestic hand-dug wells, which are not considered as safe drinking water supplies. Other residents use community boreholes equipped with solar or hand pumps, or private boreholes. Groundwater also supports cash crops smallholders in the fringe of the city and hotels.

Groundwater use in the rest of the country: Because the Gambia River is under tidal influence until far inland, all drinking water is abstracted from the Shallow Sandstone Aquifer in the Gambia.

Groundwater issues and impacts: The limited collection and treatment of wastewater and solid waste is a concern for groundwater quality in the phreatic aquifer (nitrates, bacteria). The proliferation of boreholes also causes a risk of over-abstraction in the semi-confined aquifer, with potential intrusion of saltwater from the sea or the river and contaminated water from the overlying phreatic aquifer.

Water demand strategy: There are plans to extend the public water supply network and to drill additional boreholes.

COTONOU - Benin

Population city: 1,527,277 (14% of country)
Population growth: 44.6% (2000 - 2015)

Climate: Tropical savanna climate with dry-winter characteristics

Hydrogeology: Cotonou is located in the Coastal Sedimentary Basin, which stretches from Ghana to Nigeria. There are two main aquifers in use: the Continental-Terminal (or Mio-Pliocene) aquifer, supplying the public water network from several wells, and the shallow Quaternary deposits tapped by many hand-dug wells. The Continental-Terminal aquifer is confined or semi-confined under a layer of clay.

Water supply: About one half of the population of the greater-Cotonou area has access to public water supply. The other half relies on local water sellers, who also extract groundwater, or on domestic hand-dug wells. Access to public water network is higher in the old, central part of Cotonou and very low in new suburban areas. The public water network is supplied by two wells, in Godomey and Ouidé. The Godomey wellfield was installed in 1956. As pumping rates increased over the years, the water levels dropped and, in the mid-1980's, the salinity increased due to the intrusion of brackish water, probably from the Nokoué lake. Several boreholes were abandoned. Originally located outside the city, Godomey is now part of it. The second wellfield was created in Ouidé in 2014, further away from the sea and from the lake. However, urban encroachment is progressing very rapidly in Ouidé. Private well owners in Godomey and Ouidé say the water levels have dropped after the wellfields were installed. This suggests a connection between the deep aquifer, tapped by the wellfields, and the shallow aquifer, tapped by hand-dug wells. In some suburban neighborhoods, water supply is shared between the urban water supply company and the organisation in charge of rural water supply.

Groundwater use in the rest of the country: In the rest of the country, only 4 cities are supplied in drinking water by surface water. Two of these cities are fully supplied from surface water (Parakou and Savalou) and the two others (Djougou and Natitingou) are partially supplied by groundwater and surface water. Groundwater account for 95% of urban water supply in the country.

Groundwater issues and impacts: Besides, saltwater intrusion, there have been several evidences of anthropogenic contamination of shallow hand-dug wells. This contamination is exacerbated during flood events, which affects mostly low-income neighborhoods. The water level in hand-dug wells is also decreasing near the wellfields, showing a potential hydraulic connection between the Quaternary deposits and the Continental-Terminal aquifer.

Water demand strategy: A third wellfield is developed at Zimé in the North-East of Calavi and is supposed to be exploited soon for the area of Abomey Calavi. Another larger wellfield will be developed in Tori in the north of Ouidah and west of Ouidé.

ACCRA - Ghana

Population city: 4,452,483 (16% of country)
Population growth: 51.3% (2000 - 2015)

Climate: Hot semi-arid climate
Tropical savanna climate with dry-winter characteristics

Hydrogeology: Accra lies on top of crystalline (mostly metamorphic) rocks, with variable storage and permeability.

Water supply: It is estimated that only 45% of the population have access to public water supply. Public water supply is derived from the Volta River, at the Akosombo dam and the Kpong treatment plant, and the Densu River at the Weija reservoir. The rest of the population relies on street vendors (bottles, bags, tanks and carts) and domestic or community hand-dug wells and boreholes. The access to public water supply is equal: the coverage in poor, suburban areas is very low. In some periurban neighborhoods, water supply is shared between the urban water supply company and the organisation in charge of rural water supply.

Groundwater use in the rest of the country: 16% of urban areas depend on groundwater

Groundwater issues and impacts: A greater part of Accra is underlain by hard rocks, where groundwater occurrence is controlled by the presence of fractures. Not all wells have a satisfying yield. Groundwater has high iron and/or chloride content.

Water demand strategy: In new neighborhoods, where public water supply have not yet been extended, individuals have drilled their own private boreholes.

LOME - Togo

Population city: 1,733,330 (25% of country)
Population growth: 61.1% (2000 - 2015)

Climate: Tropical savanna climate with dry-winter characteristics

Hydrogeology: Lomé is located in the Coastal Sedimentary Basin, which stretches from Ghana to Nigeria. There are several aquifers in use (from deeper to shallower): the Maastrichtian, Paleocene and Continental-Terminal (or Mio-Pliocene) aquifers and the Quaternary deposits.

Water supply: It is estimated that 44% of the population has access to public water supply, mostly in the city centre. In suburban areas, the access is lower than 5%. The public water network is supplied by groundwater, 70% of which is abstracted from the Continental-Terminal aquifer. Residents without access to public water supply rely on domestic or community hand-dug wells and boreholes, or groundwater sold by private sellers. The Continental-Terminal aquifer is also tapped by several boreholes for industrial use.

Groundwater use in the rest of the country: 85% of groundwater use in Togo in 2009.

Groundwater issues and impacts: There have been several evidences of anthropogenic contamination of shallow hand-dug wells. This contamination is exacerbated during flood events, which affects mostly low-income neighborhoods. Because of the significant use of the Continental-Terminal aquifer, water levels have declined. Saline intrusions are occurring in the Continental-Terminal aquifer and coastal sands. Nitrate pollution is found in groundwater underlying highly populated areas.

Water demand strategy: Additional boreholes are drilled in 2020. There is the Soglagokope-Lome project, under study, for bringing water from the Volta River in Ghana, 80 km away from Lomé.

CONAKRY - Guinea

Population city: 2,195,995 (20% of country)
Population growth: 43.2% (2000 - 2015)

Climate: Tropical monsoon climate

Hydrogeology: Conakry is located on igneous rocks that are weathered near the surface.

Water supply: In 2011, it was estimated that 35% of the population had a private access to public water supply, 30% was getting access through the neighbours and 7% had access via public fountains. Most of water supply is provided by surface water reservoirs, in particular the reservoir at Grandes Chutes, 60 km from Conakry. 15% is provided by groundwater (7 boreholes). Since water is supplied by gravity, the higher neighborhoods are poorly served. Residents without access to public water supply rely on hand-dug wells, boreholes or private vendors.

Groundwater use in the rest of the country: In total, 34% of urban centres rely on groundwater.

Groundwater issues and impacts: Groundwater is naturally contaminated by fluoride and arsenic. There are also many evidences of contamination of wells by faecal bacteria, caused by the gaps in wastewater treatment. It appears that a majority of shallow hand-dug wells doesn't meet WHO standards.

Water demand strategy: An additional pumping station of surface water will be built at the Kale dam.

ACCRA - Ghana

Population city: 4,452,483 (16% of country)
Population growth: 51.3% (2000 - 2015)

Climate: Hot semi-arid climate
Tropical savanna climate with dry-winter characteristics

Hydrogeology: Accra lies on top of crystalline (mostly metamorphic) rocks, with variable storage and permeability.

Water supply: It is estimated that only 45% of the population have access to public water supply. Public water supply is derived from the Volta River, at the Akosombo dam and the Kpong treatment plant, and the Densu River at the Weija reservoir. The rest of the population relies on street vendors (bottles, bags, tanks and carts) and domestic or community hand-dug wells and boreholes. The access to public water supply is equal: the coverage in poor, suburban areas is very low. In some periurban neighborhoods, water supply is shared between the urban water supply company and the organisation in charge of rural water supply.

Groundwater use in the rest of the country: 16% of urban areas depend on groundwater

Groundwater issues and impacts: A greater part of Accra is underlain by hard rocks, where groundwater occurrence is controlled by the presence of fractures. Not all wells have a satisfying yield. Groundwater has high iron and/or chloride content.

Water demand strategy: In new neighborhoods, where public water supply have not yet been extended, individuals have drilled their own private boreholes.

MONROVIA - Liberia

Population city: 1,190,635 (29% of country)
Population growth: 35.9% (2000 - 2015)

Climate: Tropical monsoon climate

Hydrogeology: Monrovia is located on the Paynesville sandstone aquifer, of Paleozoic-Mesozoic age, which overlies a gneiss basement. The sandstone aquifer is topped by Quaternary deposits.

Water supply: The public water network has been severely damaged during the civil war in 2002. It relies principally on the Guma Dam (over 90%). Residents who are not connected to the public network mostly rely on shallow hand-dug wells.

Groundwater use in the rest of the country: The rest of the country relies on hand-dug wells and, to a lesser extent (10%) on boreholes.

Groundwater issues and impacts: Hand-dug wells are particularly vulnerable to contamination. Given the gap of public and private water treatment, the city is prone to water-borne diseases.

Water demand strategy: The Freetown Water Supply Rehabilitation project is to rehabilitate the water infrastructure.

ABIDJAN - Cote d'Ivoire

Population city: 4,717,347 (20% of country)
Population growth: 35.8% (2000 - 2015)

Climate: Tropical savanna climate with dry-winter characteristics

Hydrogeology: Abidjan is located in the Coastal Sedimentary Basin. The following aquifers are used:

- the deep Maastrichtian aquifer (±200m deep), exploited by a bottle water company,
- the Continental-Terminal (or Mio-Pliocene) aquifer, semi-confined, supplying the public water network, and
- the shallow Quaternary deposits, exploited through hand-dug wells.

Water supply: The public water supply company relies exclusively on groundwater from the Continental-Terminal aquifer. It recorded 535,000 connections in 2018. Another source indicates that water supply meets 85% of water demand, but without taking the losses of the network into account. A third source estimates that 70% of the population has access to public water supply. Water supply was not steady until an additional wellfield was created in 2017 in Bonoua, 60 km from Abidjan. The residents without access to the public network rely on private sellers, most of which tap water from the public network, or on hand-dug wells in the Quaternary deposits, in particular in low-income neighborhoods.

Groundwater use in the rest of the country: Most of the large cities in the country rely on surface water (Bouaké, Yamoussoukro, Daloa, Korhogo, Man, etc.), either from reservoirs or from pumping stations on the rivers. Villages and small cities that are not supplied by the reservoirs rely mostly on groundwater.

Groundwater issues and impacts: Anthropogenic contamination was found in several hand-dug wells, indicated by high nitrate, sulfate and chloride concentrations and the presence of bacteria. Near the coast, saline water is found in hand-dug wells. Nitrate contamination was also reported in boreholes supplying the public water network, like the wellfield of Plateau, which was abandoned.

Water demand strategy: A treatment plant is in construction on the M6 River, 40 km from Abidjan, which should be ready in 2021.

ACCRA - Ghana

Population city: 4,452,483 (16% of country)
Population growth: 51.3% (2000 - 2015)

Climate: Hot semi-arid climate
Tropical savanna climate with dry-winter characteristics

Hydrogeology: Accra lies on top of crystalline (mostly metamorphic) rocks, with variable storage and permeability.

Water supply: It is estimated that only 45% of the population have access to public water supply. Public water supply is derived from the Volta River, at the Akosombo dam and the Kpong treatment plant, and the Densu River at the Weija reservoir. The rest of the population relies on street vendors (bottles, bags, tanks and carts) and domestic or community hand-dug wells and boreholes. The access to public water supply is equal: the coverage in poor, suburban areas is very low. In some periurban neighborhoods, water supply is shared between the urban water supply company and the organisation in charge of rural water supply.

Groundwater use in the rest of the country: 16% of urban areas depend on groundwater

Groundwater issues and impacts: A greater part of Accra is underlain by hard rocks, where groundwater occurrence is controlled by the presence of fractures. Not all wells have a satisfying yield. Groundwater has high iron and/or chloride content.

Water demand strategy: In new neighborhoods, where public water supply have not yet been extended, individuals have drilled their own private boreholes.

LOME - Togo

Population city: 1,733,330 (25% of country)
Population growth: 61.1% (2000 - 2015)

Climate: Tropical savanna climate with dry-winter characteristics

Hydrogeology: Lomé is located in the Coastal Sedimentary Basin, which stretches from Ghana to Nigeria. There are several aquifers in use (from deeper to shallower): the Maastrichtian, Paleocene and Continental-Terminal (or Mio-Pliocene) aquifers and the Quaternary deposits.

Water supply: It is estimated that 44% of the population has access to public water supply, mostly in the city centre. In suburban areas, the access is lower than 5%. The public water network is supplied by groundwater, 70% of which is abstracted from the Continental-Terminal aquifer. Residents without access to public water supply rely on domestic or community hand-dug wells and boreholes, or groundwater sold by private sellers. The Continental-Terminal aquifer is also tapped by several boreholes for industrial use.

Groundwater use in the rest of the country: 85% of groundwater use in Togo in 2009.

Groundwater issues and impacts: There have been several evidences of anthropogenic contamination of shallow hand-dug wells. This contamination is exacerbated during flood events, which affects mostly low-income neighborhoods. Because of the significant use of the Continental-Terminal aquifer, water levels have declined. Saline intrusions are occurring in the Continental-Terminal aquifer and coastal sands. Nitrate pollution is found in groundwater underlying highly populated areas.

Water demand strategy: Additional boreholes are drilled in 2020. There is the Soglagokope-Lome project, under study, for bringing water from the Volta River in Ghana, 80 km away from Lomé.

DAKAR - Senegal

Population city: 3,067,637 (22% of country)
Population growth: 36% (2000 - 2015)

Climate: Hot semi-arid climate

Hydrogeology: Dakar is located in the Senegalo-Mauritanian Basin, which stretches from Guinea-Bissau to Mauritania. There are several aquifers available: the deep Maastrichtian sandstone aquifer, the Paleocene limestones, the Lutetian limestones, the Quaternary infrafossiliferous aquifer and Thiarye sands aquifer.

Water supply: All residents of Dakar have access to public water supply, either through private taps (96%) or public fountains (4%). Half of the network is supplied by boreholes, tapping various aquifers near Dakar. Since 1972 and to cope with the demographic growth, water is also pumped from the Lac de Guilers, 250 km away from Dakar.

Groundwater use in the rest of the country: In Senegal, 150 out of the 193 urban centers managed by the national urban water supply company rely exclusively on groundwater.

Groundwater issues and impacts: Sewerage intrusion due to overabstraction and declining water levels have been reported in the boreholes tapping the shallow Quaternary aquifers (Infrafossiliferous and Thiarye). Nitrate contamination has also been reported since the 80's, leading to the closure of many boreholes. The interruption of pumping has caused seasonal lakes and recurrent flooding in suburban areas. Urban encroachment is a concern for the protection of wellfields originally located outside of the city.

Water demand strategy: A seawater desalination plant is under construction in Dakar. Project for a second seawater desalination plant is in discussion. Pumping capacity at the Lac de Guilers will increase in the next years.

BANJUL - Gambia

Population city: 33,382 (2% of country)
Population growth: -10.1% (2000 - 2015)

Climate: Tropical savanna climate with dry-winter characteristics

Hydrogeology: Banjul is located in the Senegalo-Mauritanian Basin, which stretches from Guinea-Bissau to Mauritania. There are two main aquifers: the Shallow Sandstone Aquifer (made of the phreatic aquifer in Quaternary deposits and the semi-confined aquifer) and the Deep Sandstone Aquifer. The latter is not exploited because it is brackish.

Water supply: About 56% of the residents have access to public water supply, either via a private tap (80%) or a public fountain (20%). The network is supplied with groundwater from the semi-confined sandstone aquifer, tapped by 77 boreholes across the Great Banjul Area although only 70 are operational. It is estimated that 20% of the population rely on domestic hand-dug wells, which are not considered as safe drinking water supplies. Other residents use community boreholes equipped with solar or hand pumps, or private boreholes. Groundwater also supports cash crops smallholders in the fringe of the city and hotels.

Groundwater use in the rest of the country: Because the Gambia River is under tidal influence until far inland, all drinking water is abstracted from the Shallow Sandstone Aquifer in the Gambia.

Groundwater issues and impacts: The limited collection and treatment of wastewater and solid waste is a concern for groundwater quality in the phreatic aquifer (nitrates, bacteria). The proliferation of boreholes also causes a risk of over-abstraction in the semi-confined aquifer, with potential intrusion of saltwater from the sea or the river and contaminated water from the overlying phreatic aquifer.

Water demand strategy: There are plans to extend the public water supply network and to drill additional boreholes.

BISSAU - Guinea-Bissau

Population city: 476,027 (27% of country)
Population growth: 27.2% (2000 - 2015)

Climate: Tropical savanna climate with dry-winter characteristics

Hydrogeology: Bissau is located in the Senegalo-Mauritanian Basin, which stretches from Guinea-Bissau to Mauritania. There are several aquifers: the deep Maastrichtian aquifer, used for public water supply, the lower-lying Paleocene-Eocene aquifer, the Oligocene aquifer, with high salinity and also high iron content in certain locations, and the shallow Miocene and Quaternary aquifers.

Water supply: The public water supply company has recorded about 22,000 connections. Assuming that one connection supplies around 6 or 10 people, it is estimated that the network supplies between 1/5 and 1/3 of the population in Bissau. Water is pumped by 16 deep boreholes tapping the Maastrichtian aquifer. Boreholes are spread over the city and supply separated networks that cover different neighborhoods. Residents without access to public water supply rely mostly on community boreholes and wells, tapping the shallow Miocene and Quaternary aquifers. Wealthy households and businesses can afford deep boreholes to reach the Maastrichtian aquifer.

Groundwater use in the rest of the country: Urban water supply is decentralized in Guinea-Bissau. It is estimated that all cities rely on groundwater.

Groundwater issues and impacts: Bacterial contaminants have been found in shallow boreholes and wells, as well as in public piped water. In the latter case, it seems to result from cracks in the pipes, where wastewater can leak in. In addition, the lack of maintenance of public supply is causing serious losses.

Water demand strategy: No information available.

MONROVIA - Liberia

Population city: 1,190,635 (29% of country)
Population growth: 35.9% (2000 - 2015)

Climate: Tropical monsoon climate

Hydrogeology: Monrovia is located on the Paynesville sandstone aquifer, of Paleozoic-Mesozoic age, which overlies a gneiss basement. The sandstone aquifer is topped by Quaternary deposits.

Water supply: The public water network has been severely damaged during the civil war in 2002. It relies principally on the Guma Dam (over 90%). Residents who are not connected to the public network mostly rely on shallow hand-dug wells.

Groundwater use in the rest of the country: The rest of the country relies on hand-dug wells and, to a lesser extent (10%) on boreholes.

Groundwater issues and impacts: Hand-dug wells are particularly vulnerable to contamination. Given the gap of public and private water treatment, the city is prone to water-borne diseases.

Water demand strategy: The Freetown Water Supply Rehabilitation project is to rehabilitate the water infrastructure.

ABIDJAN - Cote d'Ivoire

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Water supply: The public water supply company relies exclusively on groundwater from the Continental-Terminal aquifer. It recorded 535,000 connections in 2018. Another source indicates that water supply meets 85% of water demand, but without taking the losses of the network into account. A third source estimates that 70% of the population has access to public water supply. Water supply was not steady until an additional wellfield was created in 2017 in Bonoua, 60 km from Abidjan. The residents without access to the public network rely on private sellers, most of which tap water from the public network, or on hand-dug wells in the Quaternary deposits, in particular in low-income neighborhoods.

Groundwater use in the rest of the country: Most of the large cities in the country rely on surface water (Bouaké, Yamoussoukro, Daloa, Korhogo, Man, etc.), either from reservoirs or from pumping stations on the rivers. Villages and small cities that are not supplied by the reservoirs rely mostly on groundwater.

Groundwater issues and impacts: Anthropogenic contamination was found in several hand-dug wells, indicated by high nitrate, sulfate and chloride concentrations and the presence of bacteria. Near the coast, saline water is found in hand-dug wells. Nitrate contamination was also reported in boreholes supplying the public water network, like the wellfield of Plateau, which was abandoned.

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Water supply: It is estimated that only 45% of the population have access to public water supply. Public water supply is derived from the Volta River, at the Akosombo dam and the Kpong treatment plant, and the Densu River at the Weija reservoir. The rest of the population relies on street vendors (bottles, bags, tanks and carts) and domestic or community hand-dug wells and boreholes. The access to public water supply is equal: the coverage in poor, suburban areas is very low. In some periurban neighborhoods, water supply is shared between the urban water supply company and the organisation in charge of rural water supply.

Groundwater use in the rest of the country: 16% of urban areas depend on groundwater

Groundwater issues and impacts: A greater part of Accra is underlain by hard rocks, where groundwater occurrence is controlled by the presence of fractures. Not all wells have a satisfying yield. Groundwater has high iron and/or chloride content.

Water demand strategy: In new neighborhoods, where public water supply have not yet been extended, individuals have drilled their own private boreholes.

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Water demand strategy: Additional boreholes are drilled in 2020. There is the Soglagokope-Lome project, under study, for bringing water from the Volta River in Ghana, 80 km away from Lomé.

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Population growth: 43.2% (2000 - 2015)

Climate: Tropical monsoon climate

Hydrogeology: Conakry is located on igneous rocks that are weathered near the surface.

Water supply: In 2011, it was estimated that 35% of the population had a private access to public water supply, 30% was getting access through the neighbours and 7% had access via public fountains. Most of water supply is provided by surface water reservoirs, in particular the reservoir at Grandes Chutes, 60 km from Conakry. 15% is provided by groundwater (7 boreholes). Since water is supplied by gravity, the higher neighborhoods are poorly served. Residents without access to public water supply rely on hand-dug wells, boreholes or private vendors.

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Groundwater issues and impacts: Groundwater is naturally contaminated by fluoride and arsenic. There are also many evidences of contamination of wells by faecal bacteria, caused by the gaps in wastewater treatment. It appears that a majority of shallow hand-dug wells doesn't meet WHO standards.

Water demand strategy: An additional pumping station of surface water will be built at the Kale dam.

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Climate: Hot semi-arid climate

Hydrogeology: Dakar is located in the Senegalo-Mauritanian Basin, which stretches from Guinea-Bissau to Mauritania. There are several aquifers available: the deep Maastrichtian sandstone aquifer, the Paleocene limestones, the Lutetian limestones, the Quaternary infrafossiliferous aquifer and Thiarye sands aquifer.

Water supply: All residents of Dakar have access to public water supply, either through private taps (96%) or public fountains (4%). Half of the network is supplied by boreholes, tapping various aquifers near Dakar. Since 1972 and to cope with the demographic growth, water is also pumped from the Lac de Guilers, 250 km away from Dakar.

Groundwater use in the rest of the country: In Senegal, 150 out of the 193 urban centers managed by the national urban water supply company rely exclusively on groundwater.

Groundwater issues and impacts: Sewerage intrusion due to overabstraction and declining water levels have been reported in the boreholes tapping the shallow Quaternary aquifers (Infrafossiliferous and Thiarye). Nitrate contamination has also been reported since the 80's, leading to the closure of many boreholes. The interruption of pumping has caused seasonal lakes and recurrent flooding in suburban areas. Urban encroachment is a concern for the protection of wellfields originally located outside of the city.

Water demand strategy: A seawater desalination plant is under construction in Dakar. Project for a second seawater desalination plant is in discussion. Pumping capacity at the Lac de Guilers will increase in the next years.

BANJUL - Gambia

Population city: 33,382 (2% of country)
Population growth: -10.1% (2000 - 2015)

Climate: Tropical savanna climate with dry-winter characteristics

Hydrogeology: Banjul is located in the Senegalo-Mauritanian Basin, which stretches from Guinea-Bissau to Mauritania. There are two main aquifers: the Shallow Sandstone Aquifer (made of the phreatic aquifer in Quaternary deposits and the semi-confined aquifer) and the Deep Sandstone Aquifer. The latter is not exploited because it is brackish.

Water supply: About 56% of the residents have access to public water supply, either via a private tap (80%) or a public fountain (20%). The network is supplied with groundwater from the semi-confined sandstone aquifer, tapped by 77 boreholes across the Great Banjul Area although only 70 are operational. It is estimated that 20% of the population rely on domestic hand-dug wells, which are not considered as safe drinking water supplies. Other residents use community boreholes equipped with solar or hand pumps, or private boreholes. Groundwater also supports cash crops smallholders in the fringe of the city and hotels.

Groundwater use in the rest of the country: Because the Gambia River is under tidal influence until far inland, all drinking water is abstracted from the Shallow Sandstone Aquifer in the Gambia.

Groundwater issues and impacts: The limited collection and treatment of wastewater and solid waste is a concern for groundwater quality in the phreatic aquifer (nitrates, bacteria). The proliferation of boreholes also causes a risk of over-abstraction in the semi-confined aquifer, with potential intrusion of saltwater from the sea or the river and contaminated water from the overlying phreatic aquifer.

Water demand strategy: There are plans to extend the public water supply network and to drill additional boreholes.

BISSAU - Guinea-Bissau

Population city: 476,027 (27% of country)
Population growth: 27.2% (2000 - 2015)

Climate: Tropical savanna climate with dry-winter characteristics

Hydrogeology: Bissau is located in the Senegalo-Mauritanian Basin, which stretches from Guinea-Bissau to Mauritania. There are several aquifers: the deep Maastrichtian aquifer, used for public water supply, the lower-lying Paleocene-Eocene aquifer, the Oligocene aquifer, with high salinity and also high iron content in certain locations, and the shallow Miocene and Quaternary aquifers.

Water supply: The public water supply company has recorded about 22,000 connections. Assuming that one connection supplies around 6 or 10 people, it is estimated that the network supplies between 1/5 and 1/3 of the population in Bissau. Water is pumped by 16 deep boreholes tapping the Maastrichtian aquifer. Boreholes are spread over the city and supply separated networks that cover different neighborhoods. Residents without access to public water supply rely mostly on community boreholes and wells, tapping the shallow Miocene and Quaternary aquifers. Wealthy households and businesses can afford deep boreholes to reach the Maastrichtian aquifer.

Groundwater use in the rest of the country: Urban water supply is decentralized in Guinea-Bissau. It is estimated that all cities rely on groundwater.

Groundwater issues and impacts: Bacterial contaminants have been found in shallow boreholes and wells, as well as in public piped water. In the latter case, it seems to result from cracks in the pipes, where wastewater can leak in. In addition, the lack of maintenance of public supply is causing serious losses.

Water demand strategy: No information available.

MONROVIA - Liberia

Population city: 1,190,635 (29% of country)
Population growth: 35.9% (2000 - 2015)

Climate: Tropical monsoon climate

Hydrogeology: Monrovia is located on the Paynesville sandstone aquifer, of Paleozoic-Mesozoic age, which overlies a gneiss basement. The sandstone aquifer is topped by Quaternary deposits.

Water supply: The public water network has been severely damaged during the civil war in 2002. It relies principally on the Guma Dam (over 90%). Residents who are not connected