

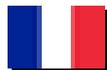
Hydrogeology of Republic of Congo

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Most of the textual information on this page was taken from the chapter on the Congo in the report '[Groundwater in Eastern, Central and Southern Africa](#)' (UN 1989). If you have more recent information on the hydrogeology of the Republic of the Congo, please get in touch.

Bantu-speaking peoples have dominated the region of the present-day Republic of the Congo (also known as Congo-Brazzaville) for over 3000 years, with several Bantu kingdoms building trade links along the Congo River. Between the 15th and 19th centuries, trade began to include European merchants. In the late 19th and early 20th centuries, French colonisers took control of the territory of the Republic of the Congo as part of the colony of French Equatorial Africa. France's colonial focus in the region was on natural resource extraction, including the use of forced labour. The Republic of the Congo became independent in 1960. In the first decades after independence the country experienced extensive civil and military unrest and changing political alliances, including a period of alignment with the Soviet Union. A short period of multi-party democracy in the 1990s, with economic reforms and structural adjustment, was followed by a civil war that ended in a peace treaty in 2003. Since then, although the country still nominally has a multi-party political system, elections have been disputed, and there has been continuing sporadic unrest.

The economy is heavily dependent on oil, and petroleum production and exports account for some 65% of GDP and 85% of government revenue. The country is therefore highly vulnerable to fluctuations in global oil price, and economic growth slowed considerably after the post-2015 fall in oil prices. Timber is the second main export after oil: rainforest covers about 60% of the country's total area. Subsistence arable agriculture is the most important livelihood activity; livestock husbandry is less important. In total, agriculture accounts for less than 10% of GDP - the most important cash crops for export are sugarcane and tobacco - and the country imports part of its food needs. The country has extensive other mineral resources apart from oil, which remain largely undeveloped, including gold, iron, other base metals and phosphate.

The country has extensive water resources, both surface and groundwater, including many large perennial rivers and widespread permeable aquifers, especially in the centre and north of the country.

□

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Compilers

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Please cite this page as: Upton & Ó Dochartaigh, 2016.

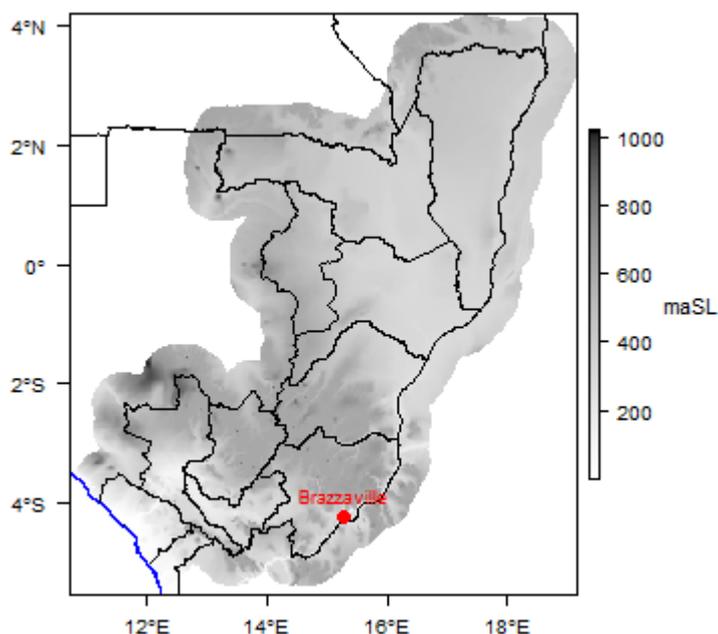
Bibliographic reference: Upton, K. & Ó Dochartaigh, B.É. 2016. Africa Groundwater Atlas: Hydrogeology of the Republic of the Congo. British Geological Survey. Accessed [date you accessed the information]. http://earthwise.bgs.ac.uk/index.php/Hydrogeology_of_Republic_of_Congo

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Geographical Setting

The Republic of the Congo lies on the equator. Parts of the country are relatively low lying plain areas, including the Congo Basin, the Niari valley and the coastal plain. Hills and plateaus surround the Congo Basin, and occur in other areas including the northwest and the central part of the country (including the Bateké plateaus), rising to over 800 m. The Mayombe range of mountains and the Chaillu massif also rise to over 800 m.



The Republic of the Congo. Map developed from USGS GTOPOPO30; GADM global administrative areas; and UN Revision of World Urbanization Prospects. For more information on the map development and datasets see the [geography resource page](#).

General

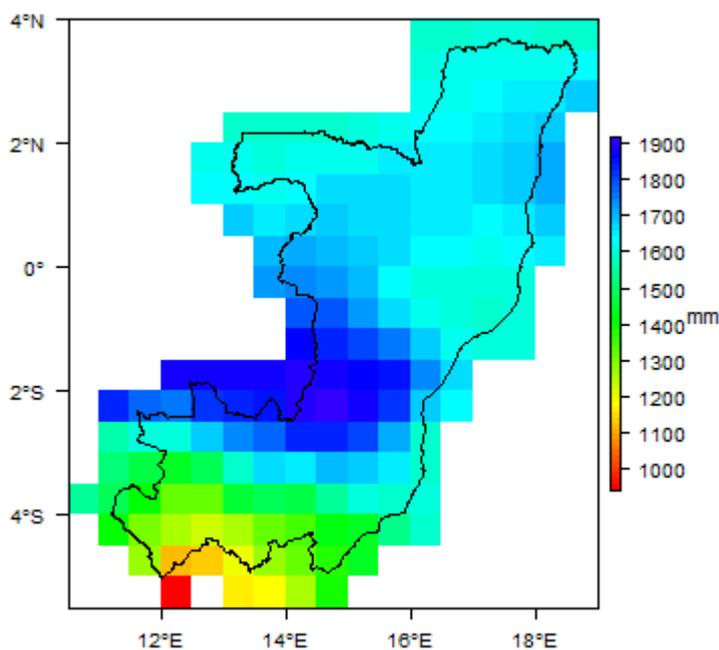
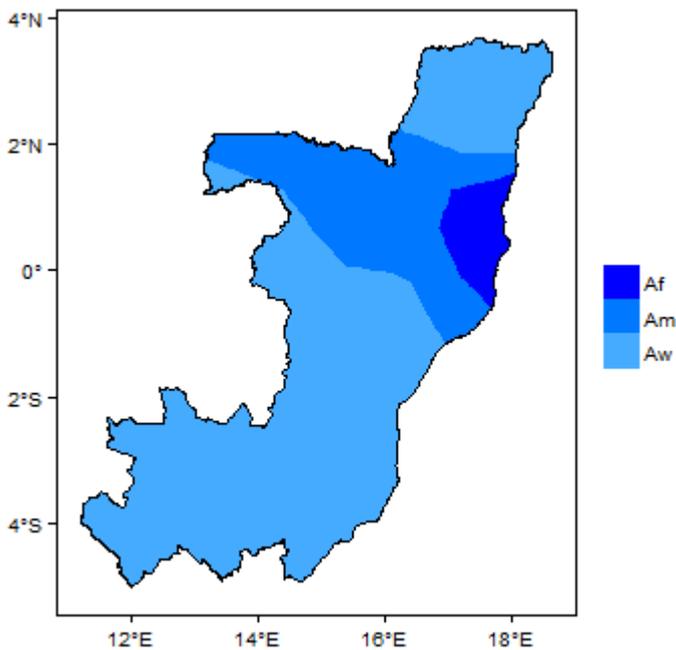
Capital city	Brazzaville
Region	Central Africa
Border countries	Gabon, Cameroon, Central African Republic, Democratic Republic of the Congo
Total surface area*	342,000 km ² (34,200,000 ha)
Total population (2015)*	4,620,000
Rural population (2015)*	1,566,000 (34%)
Urban population (2015)*	3,054,000 (66%)
UN Human Development Index (HDI) [highest = 1] (2014)*	0.5906

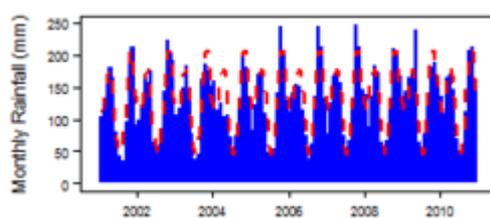
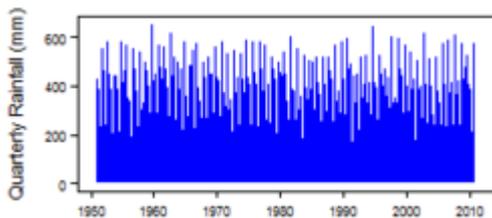
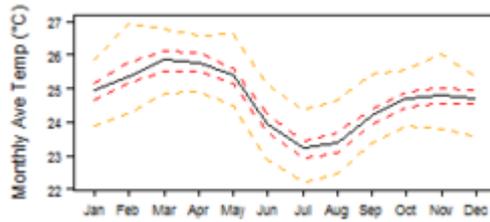
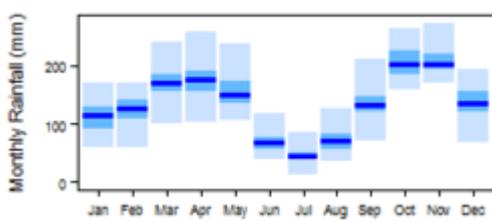
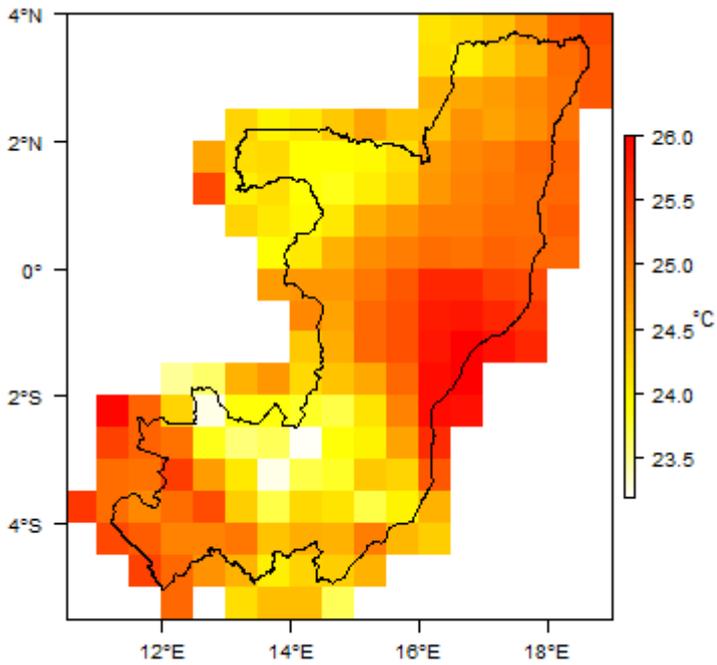
* Source: [FAO Aquastat](#)

Climate

In the north of the country the climate is equatorial and rain occurs throughout the year, with two slightly less rainy periods from December to February and in July. The centre of the country is a sub-equatorial zone, with two distinct wetter seasons in March/April and October/November. The southwest is a wet tropical zone, with a rainy season that lasts from about October to May, and a dry season from June to September. Total rainfall everywhere is relatively high, at least 1000 mm/year and up to 3000 mm/year in the wettest zones.

Effective precipitation is also high, estimated for the years 1955 to 1970 at between 750 and 1250 mm/year in the coastal basin; 200 to 750 mm/year in the Niari valley and the Congo Basin; and 1000 to 1250 mm/year over the central plateaus.



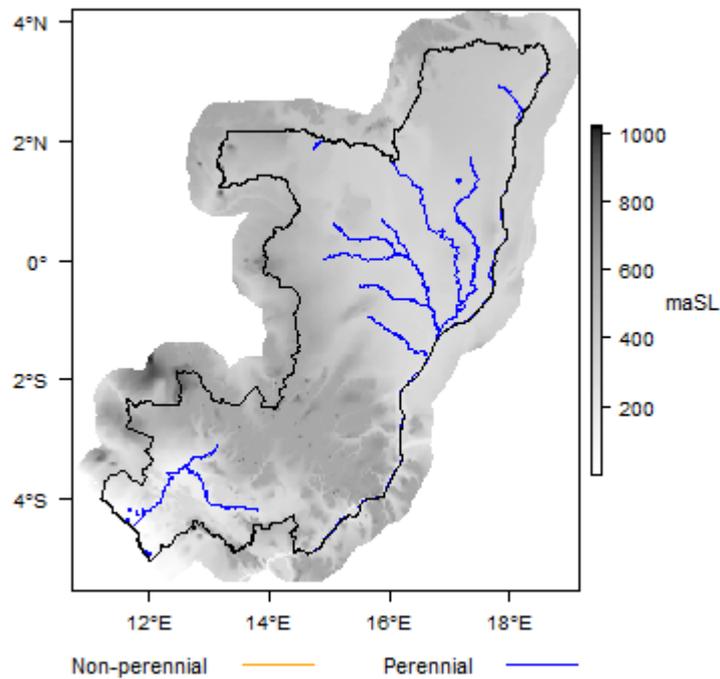


More information on average rainfall and temperature for each of the climate zones in Republic of Congo can be seen at the [Republic of Congo climate page](#).

These maps and graphs were developed from the CRU TS 3.21 dataset produced by the Climatic Research Unit at the University of East Anglia, UK. For more information see the [climate resource page](#).

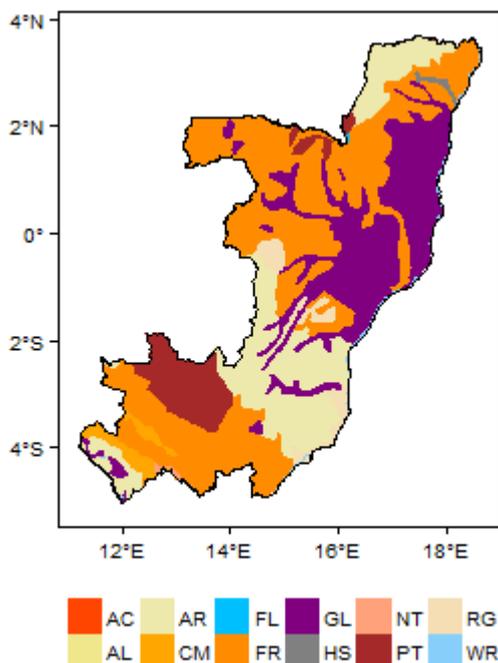
Surface water

There are many major rivers in the Republic of the Congo, in two main basins: the Congo River in the centre and north (which extends over several countries), and the Kouilou-Niari in the southwest. There are also small coastal basins, and the upper part of the Nyanga and Ogouué basins. Most are perennial, owing to the high rainfall and groundwater baseflow.



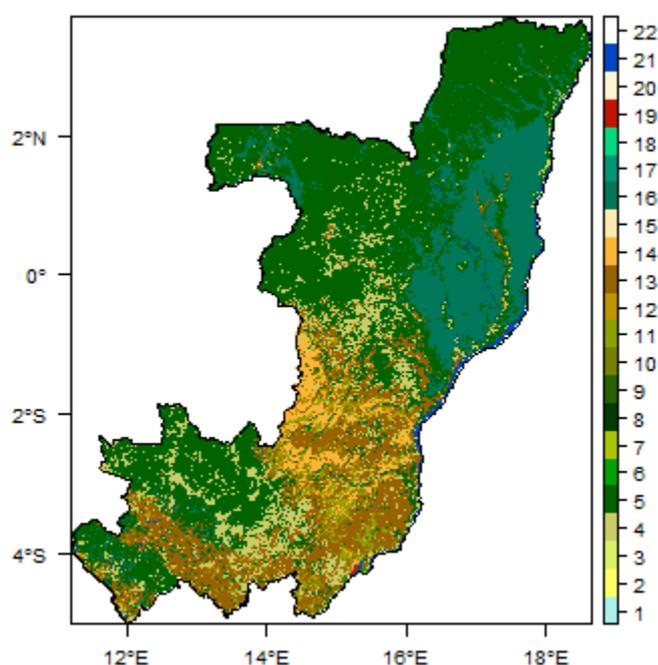
Major surface water features of the Republic of the Congo. Map developed from World Wildlife Fund HydroSHEDS; Digital Chart of the World drainage; and FAO Inland Water Bodies. For more information on the map development and datasets see the [surface water resource page](#).

Soil



Soil Map of the Republic of the Congo, from the European Commission Joint Research Centre: European Soil Portal. For more information on the map see the [soil resource page](#).

Land cover



Land Cover Map of the Republic of the Congo, from the European Space Agency GlobCover 2.3, 2009. For more information on the map see the [land cover resource page](#).

Water statistics

	1997	2002	2005	2014	2015
Rural population with access to safe drinking water (%)					40
Urban population with access to safe drinking water (%)					95.8
Population affected by water related disease (per 1000 inhabitants)		175.2			
Total internal renewable water resources (cubic metres/inhabitant/year)				48,052	
Total exploitable water resources (Million cubic metres/year)	No data				
Freshwater withdrawal as % of total renewable water resources		0.0055			
Total renewable groundwater (Million cubic metres/year)				122,000	
Exploitable: Regular renewable groundwater (Million cubic metres/year)	No data				
Groundwater produced internally (Million cubic metres/year)				122,000	
Fresh groundwater withdrawal (primary and secondary) (Million cubic metres/year)		24			
Groundwater: entering the country (total) (Million cubic metres/year)					
Groundwater: leaving the country to other countries (total) (Million cubic metres/year)					
Industrial water withdrawal (all water sources) (Million cubic metres/year)			24		
Municipal water withdrawal (all water sources) (Million cubic metres/year)			63.7		

Agricultural water withdrawal (all water sources) (Million cubic metres/year)		4			
Irrigation water withdrawal (all water sources) ¹ (Million cubic metres/year)	No data				
Irrigation water requirement (all water sources) ¹ (Million cubic metres/year)	1.1				
Area of permanent crops (ha)				77,000	
Cultivated land (arable and permanent crops) (ha)				627,000	
Total area of country cultivated (%)				1.833	
Area equipped for irrigation by groundwater (ha)	No data				
Area equipped for irrigation by mixed surface water and groundwater (ha)	No data				

These statistics are sourced from [FAO Aquastat](#). They are the most recent available information in the Aquastat database. More information on the derivation and interpretation of these statistics can be seen on the [FAO Aquastat website](#).

Further water and related statistics can be accessed at the [Aquastat Main Database](#).

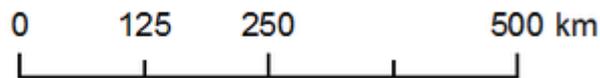
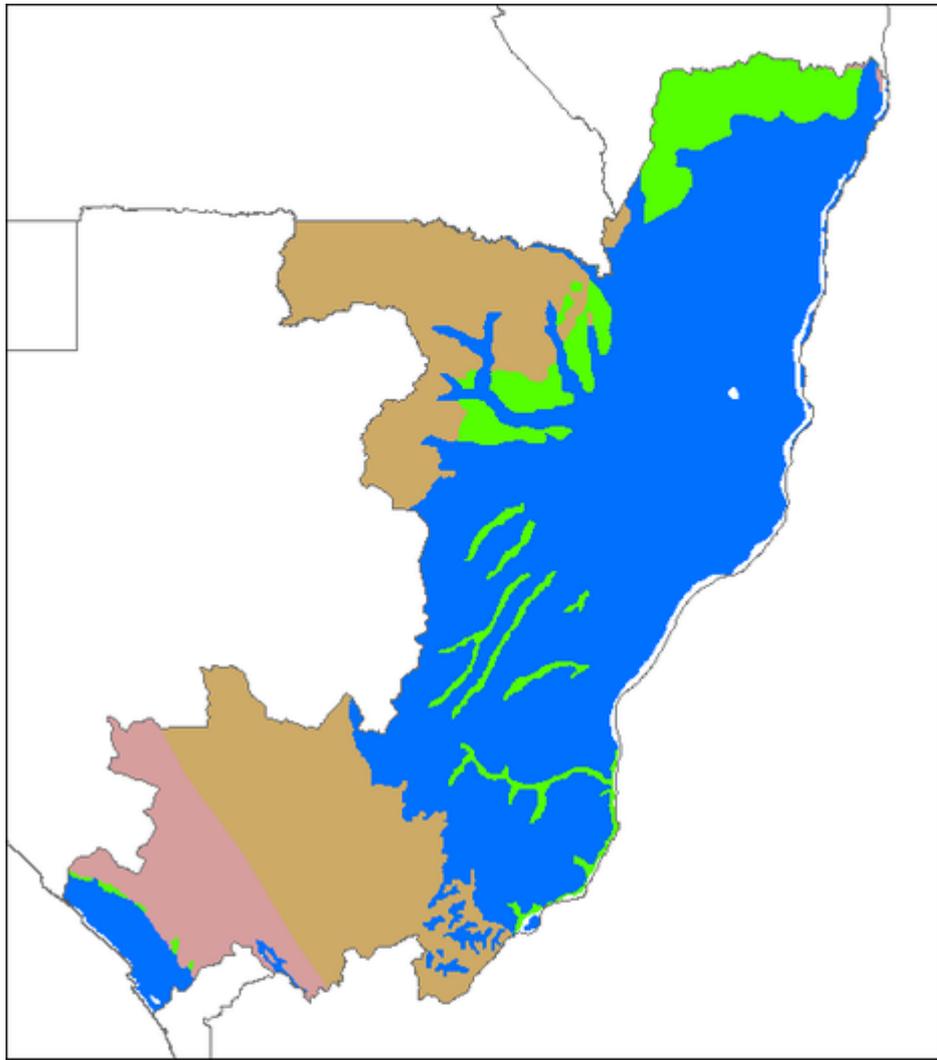
¹ More information on [irrigation water use and requirement statistics](#)

Geology

This section provides a summary of the geology of the Republic of the Congo. More information is available in the report [Groundwater in Eastern, Central and Southern Africa: Congo](#) (1989) (see References section, below).

The geology map shows a simplified overview of the geology at a national scale (see [the Geology resources page](#) for more details).

[Download a GIS shapefile of the Republic of the Congo geology and hydrogeology map.](#)



Republic of the Congo - Geology

- Salt dome
- Quaternary unconsolidated
- Sedimentary - Cretaceous-Tertiary
- Upper Precambrian metasedimentary - sometimes karstic
- Upper Precambrian metasedimentary
- Middle and Lower Precambrian Basement

Geology of the Republic of the Congo at 1:5 million scale. Based on map described by Persits et al. 2002 / Furon and Lombard 1964. For more information on the map development and datasets see the [geology resource page](#). [Download a GIS shapefile of the Republic of the Congo geology and hydrogeology map](#).

Key Formations		Period	Geological Environments	Lithology
				Quaternary unconsolidated

River alluvium and coastal deposits	Quaternary	Alluvium sands and silts cover immense areas of swamp in the Congo Basin and are up to 400 m thick. Smaller areas of coastal sands occur along the coastal plateau.
		Cenozoic sedimentary
	Cenozoic	Found in the coastal plain and the central Bateké plateau. In the coastal plain, a series of sedimentary rocks rests on Lower Precambrian Mayombe series. From youngest to oldest, they include sandy to sandy-argillaceous rocks (50 to 200 m); sandy clays and argillaceous sands (up to 150 m); coarse grained ferruginous sands (up to 100 m); dolomitic sandstones and clays; and dolomitic limestones (60 to 400 m). The Bateké plateau series comprises around 300 m of sandstones overlain by 40 to 90 m of sandy silts.
		Mesozoic sedimentary
	Mesozoic	Seen in very small areas along the banks of the Congo River and its tributaries in Pool and in northern Likouala.
		Precambrian metasedimentary, metamorphic and granitic
Inkisi series; Mpioka series; schist-limestone series in Djoué valley; Bouenza and Louila series	Upper Precambrian	Meta-sedimentary formations, including: - the Inkisi series southwest of Brazzaville (600 m thick), including conglomerates, arkoses and sandstones; - the Mpioka series in the Chaillu massif, including conglomerates and sandstones, often calcareous; - a schist-limestone series in the Djoué valley in the southeast (700 to 1000 m thick), comprising mainly carbonate rocks - dolomites, marly limestones, marls and oolitic and stromatalitic limestones, with some sandstones at the top; - a tillite series in the Lower Congo basin; - the Bouenza series, cropping out on the northeast slope of the Niari syncline and resting directly on the Chaillu granitic complex, which comprises argillites, feldspathic sandstones, limestones, marls and calcareous sandstones; and - the Louila series, the counterpart of the Bouenza series in the southwest of the Niari syncline, cropping out only in the Mayombe mountains between the upper and lower tillite series. Between 650 and 1000 m thick, it includes clays, argillites, sandstones and marls, and marly limestones.
Basement: granite, gneiss, schists, quartzites	Middle and Lower Precambrian	Granitic and gneissic basement rocks are seen in the Chaillu massif and in western Sangha. Metamorphic, deformed formations seen in the Mayombe mountains and the Niari valley. The metamorphic rocks include schists and metamorphosed sandstones (quartzites) and dolomites.

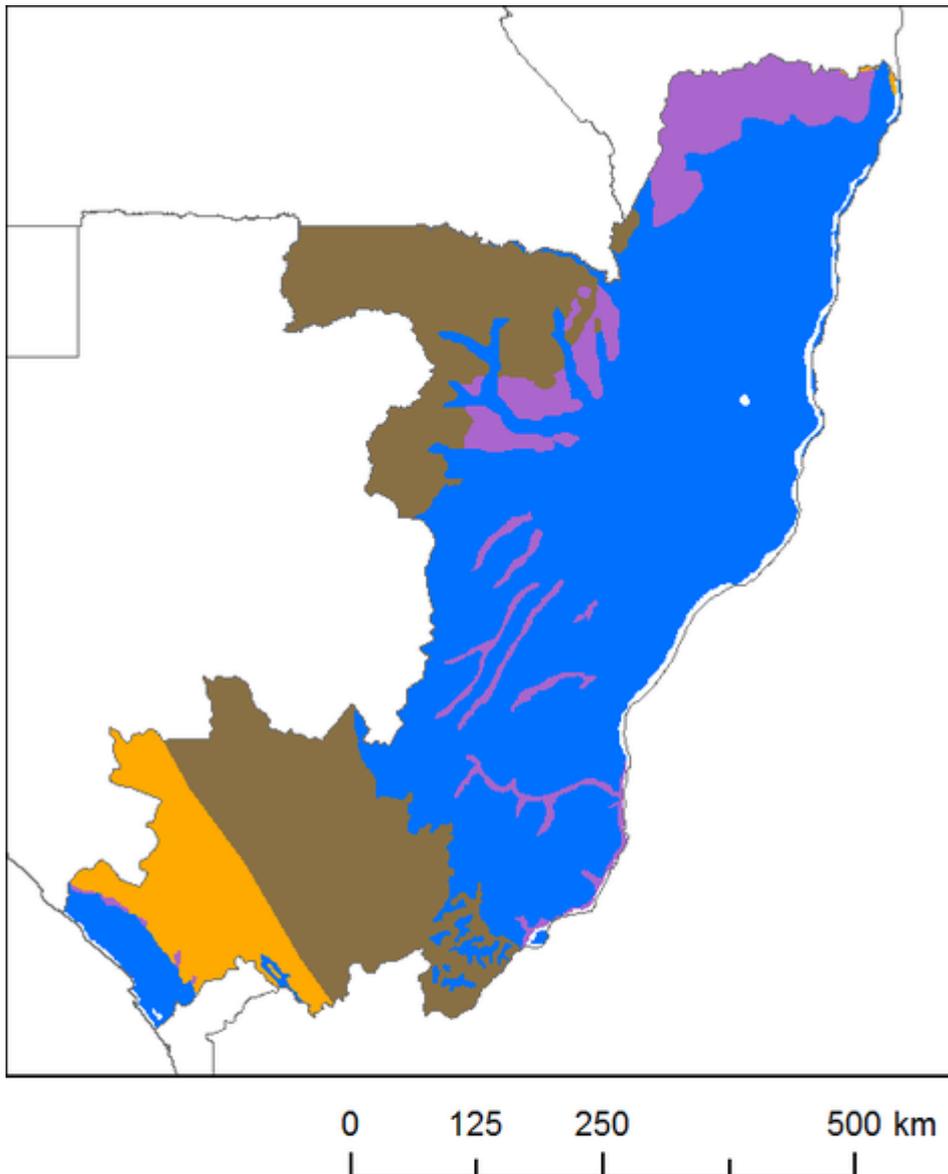
Hydrogeology

This section provides a summary of the hydrogeology of the main aquifers in the Republic of the Congo. More information is available in the report [Groundwater in Eastern, Central and Southern Africa: Congo](#) (1989) (see References section, below).

The hydrogeology map shows a simplified overview of the type and productivity of the main aquifers at a national scale (see the [hydrogeology map](#) resource page for more details).

[Download a GIS shapefile of the Republic of the Congo geology and hydrogeology map.](#)

Another map of water resources in the Republic of Congo and Gabon at 1:1,000,000 scale was published by [BRGM/CIEH](#) (1982), with an [accompanying report](#).



Republic of the Congo - Aquifer Type and Productivity

-  Unconsolidated - Moderate to High
-  Sedimentary Intergranular/Fracture - Moderate to High
-  Sedimentary Fracture - Moderate to High
-  Basement - Low

Hydrogeology of the Republic of the Congo at 1:5 million scale. For more information on how the map was developed see the [Hydrogeology map](#) resource page. [Download a GIS shapefile of the Republic of the Congo geology and hydrogeology map.](#)

Unconsolidated

Named Aquifers	Aquifer Productivity	General Description	Water quality
Congo Basin Alluvium	Moderate to High	These deposits cover an immense area and are thought to be up to 400 m thick. They are likely to be relatively highly permeable and to store a large volume of groundwater.	Thought to generally have a low mineral content and a pH of less than 6.5.

Sedimentary - Intergranular/Fracture Flow

Named Aquifers	Aquifer Productivity	General Description	Water quality
Coastal basin	Moderate to High	A series of sands (variously clay-rich or argillaceous), clays, dolomitic sandstones and dolomitic limestones. Many potash, oil and water exploration boreholes have been drilled to depths of between 250 and 400 m. Recorded yields from borehole tests were generally between 10 and 20 m ³ /hour.	Overall the groundwater has a low mineral content, below 250 mg/l, with a relatively low hardness and a pH of close to 7. However, chloride and sulphate can be high, varying between 2 and 80 mg/l, and there is relatively high salinity in tested boreholes at depths of 250 to 400 m, generally between 0.6 and 3.5 g/l (NaCl equivalent).
Stanley Pool series		Located at Brazzaville, this is a dominantly sandstone series, sometimes marly or kaolinitic.	Thought to generally a low mineral content and a pH of less than 6.
Bateké plateau series	Moderate (occasionally Low)	A few shallow (e.g. 20 to 30 m) boreholes are used for water supply in some areas. One deep (300 m) borehole drilled in 1960 provided a yield of about 6 m ³ /hour for 20 to 25 m of drawdown (a specific capacity of about 6 to 7 m ³ /day/m). The highest permeabilities are thought to be in sandy series, with values of between about 5 and 60 m ² /day. Low productivity perched aquifers are known, from 3 to 70 m depth, which sometimes show small spring flows.	Generally a low mineral content and a pH of between 5.3 and 6.

Sedimentary - Fracture Flow

Named Aquifers	Aquifer Productivity	General Description	Water quality
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Precambrian metasedimentary series: Inkisi; Mpioka; schist-limestone in Djoué valley; Bouenza and Louila	Moderate to High	Drilling tests indicated moderate to high permeability. Borehole yields in similar formations in Gabon are between 0.5 and 24 m ³ /hour. A borehole at Loudima yielded 16 m ³ /hour with hardly any drawdown. Other boreholes between 20 and 70 m deep had rest water levels of between 6 and 35 m below ground level, and specific capacity values of 0.2 to 432 m ³ /day/m.	Groundwater in the schist-limestone formations has an average mineral content of 350 to 500 mg/l, and is of average hardness, with a pH of 7 or higher. Other formations, where tested, generally have a low mineral content and a pH of 6 to 6.5.
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Basement

Named Aquifers	Aquifer Productivity	General Description	Water quality
Granite and gneiss, schists, quartzites	Low	Generally low permeability and groundwater potential.	Typically low mineral content, with a pH of around 6.

Groundwater Status

Recharge to aquifers in the Republic of the Congo is likely to be high, because of high rainfall and the widespread distribution of relatively highly permeable aquifers.

Groundwater use and management

Groundwater use

The abundance of surface water in the country means that groundwater is not likely to be very heavily exploited. The town of Pointe-Noire is supplied by groundwater from at least three boreholes. Private industrial groundwater supplies are also used in Pointe-Noire. Programmes of borehole drilling for village water supplies were carried out in the 1980s, including the a FRG-KFW project which constructed 80 boreholes with hand pumps in the Niari region.

Groundwater management

In the 1980s, several government agencies were involved in water supply, including the Ministry of Planning (responsible for coordinating drinking water supply); the Department of Agricultural Engineering and Farm Machinery (DGRMA) (responsible for hydro-agricultural development, and also involved in village water supply drilling projects); the National Water and Energy Corporation (SNDE) (responsible for urban water supply); and the Ministry of Energy and Water Supply (established in 1984 and responsible for coordinating the study, exploitation and management of the country's water resources).

Until the late 1980s at least, there had been only a few groundwater studies, including the development of a groundwater supply for the town of Pointe-Noire in the 1950s; a number of local drinking and industrial water supply projects; some studies related to dam construction; and a [water](#)

[resources planning map](#), with [accompanying report](#) of Gabon and Congo published by BRGM and the Comite Interfricain d'Etudes Hydrauliques (CIEH).

References

The following references provide more information on the geology and hydrogeology of the Republic of the Congo. They can also be accessed through the [Africa Groundwater Literature Archive](#).

CIEH/BRGM. 1982. [Carte de Planification des Ressources en Eau du Gabon et du Congo; scale: 1 : 1 000 000](#). Comité Interfricain d'Etudes Hydrauliques, Ouagadougou & Bureau de Recherches Géologiques et Minières (BRGM), Orléans

CIEH/BRGM. 1982. [Notice explicative de la carte de planification des ressources en eau du Gabon et du Congo](#). Serie hydrogeologie de Comite Interfricain d'Etudes Hydrauliques (CIEH), 116 pp, Ouagadougou, Burkina Faso.

United Nations. 1989. [Groundwater in Eastern, Central and Southern Africa: Congo](#). United Nations Department of Technical Cooperation for Development, Natural Resources/Water Series No.19

The reference list in the UN report (1989) provides other sources of information, although none are more recent than 1982.

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