Water Risk Filter

Country Overview - Niger

Water Indicators

Indicator	Value	Description	Source
Overall Basin Risk (score)	3.25	Overall Basin Risk (score)	
Overall Basin Risk (rank)	9	Overall Basin Risk (rank)	
Physical risk (score)	3.54	Physical risk (score)	
Physical risk (rank)	5	Physical risk (rank)	
Regulatory risk (score)	3.28	Regulatory risk (score)	
Regulatory risk (rank)	38	Regulatory risk (rank)	
Reputation risk (score)	2.36	Reputation risk (score)	
Reputation risk (rank)	151	Reputation risk (rank)	
1. Quantity - Scarcity (score)	3.99	1. Quantity - Scarcity (score)	
1. Quantity - Scarcity (rank)	11	1. Quantity - Scarcity (rank)	
2. Quantity - Flooding (score)	3.00	2. Quantity - Flooding (score)	
2. Quantity - Flooding (rank)	106	2. Quantity - Flooding (rank)	
3. Quality (score)	4.58	3. Quality (score)	
3. Quality (rank)	3	3. Quality (rank)	
4. Ecosystem Service Status (score)	1.49	4. Ecosystem Service Status (score)	
4. Ecosystem Service Status (rank)	170	4. Ecosystem Service Status (rank)	
5. Enabling Environment (Policy & Laws) (score)	3.00	5. Enabling Environment (Policy & Laws) (score)	
5. Enabling Environment (Policy & Laws) (rank)	58	5. Enabling Environment (Policy & Laws) (rank)	
6. Institutions and Governance (score)	3.00	6. Institutions and Governance (score)	
6. Institutions and Governance (rank)	82	6. Institutions and Governance (rank)	
7. Management Instruments (score)	3.03	7. Management Instruments (score)	
7. Management Instruments (rank)	74	7. Management Instruments (rank)	
8 - Infrastructure & Finance (score)	4.80	8 - Infrastructure & Finance (score)	
8 - Infrastructure & Finance (rank)	9	8 - Infrastructure & Finance (rank)	
9. Cultural Diversity (score)	3.00	9. Cultural importance (score)	
9. Cultural Diversity (rank)	30	9. Cultural importance (rank)	
10. Biodiversity Importance (score)	1.26	10. Biodiversity importance (score)	

Indicator	Value	Description	Source
10. Biodiversity Importance (rank)	194	10. Biodiversity importance (rank)	
11. Media Scrutiny (score)	2.10	11. Media Scrutiny (score)	
11. Media Scrutiny (rank)	151	11. Media Scrutiny (rank)	
12. Conflict (score)	2.81	12. Conflict (score)	
12. Conflict (rank)	65	12. Conflict (rank)	
1.0 - Aridity (score)	4.49	The aridity risk indicator is based on the Global Aridity Index (Global-Aridity) and Global Potential Evapo-Transpiration (Global-PET) Geospatial data sets by Trabucco and Zomer (2009). These data sets provide information about the potential availability of water in regions with low water demand, thus they are used in the Water Risk Filter 5.0 to better account for deserts and other arid areas in the risk assessment.	Trabucco, A., & Zomer, R. J. (2009). Global potential evapo-transpiration (Global-PET) and global aridity index (Global-Aridity) geo-database. CGIAR consortium for spatial information.
1.0 - Aridity (rank)	5	The aridity risk indicator is based on the Global Aridity Index (Global-Aridity) and Global Potential Evapo-Transpiration (Global-PET) Geospatial data sets by Trabucco and Zomer (2009). These data sets provide information about the potential availability of water in regions with low water demand, thus they are used in the Water Risk Filter 5.0 to better account for deserts and other arid areas in the risk assessment.	Trabucco, A., & Zomer, R. J. (2009). Global potential evapo-transpiration (Global-PET) and global aridity index (Global-Aridity) geo-database. CGIAR consortium for spatial information.
1.1 - Water Depletion (score)	2.91	The water depletion risk indicator is based on annual average monthly net water depletion from Brauman et al. (2016). Their analysis is based on model outputs from the newest version of the integrated water resources model WaterGAP3 which measures water depletion as the ratio of water consumption-to-availability.	Brauman, K. A., Richter, B. D., Postel, S., Malsy, M., & Flörke, M. (2016). Water depletion: An improved metric for incorporating seasonal and dry-year water scarcity into water risk assessments. Elem Sci Anth, 4.
1.1 - Water Depletion (rank)	60	The water depletion risk indicator is based on annual average monthly net water depletion from Brauman et al. (2016). Their analysis is based on model outputs from the newest version of the integrated water resources model WaterGAP3 which measures water depletion as the ratio of water consumption-to-availability.	Brauman, K. A., Richter, B. D., Postel, S., Malsy, M., & Flörke, M. (2016). Water depletion: An improved metric for incorporating seasonal and dry-year water scarcity into water risk assessments. Elem Sci Anth, 4.
1.2 - Baseline Water Stress (score)	3.56	World Resources Institute's Baseline Water Stress measures the ratio of total annual water withdrawals to total available annual renewable supply, accounting for upstream consumptive use. A higher percentage indicates more competition among users.	Hofste, R., Kuzma, S., Walker, S., ... & Sutanudjaja, E.H. (2019). Aqueduct 3.0: Updated decision relevant global water risk indicators. Technical note. Washington, DC: World Resources Institute.

Indicator	Value	Description	Source
1.2 - Baseline Water Stress (rank)	37	World Resources Institute’s Baseline Water Stress measures the ratio of total annual water withdrawals to total available annual renewable supply, accounting for upstream consumptive use. A higher percentage indicates more competition among users.	Hofste, R., Kuzma, S., Walker, S., ... & Sutanudjaja, E.H. (2019). Aqueduct 3.0: Updated decision relevant global water risk indicators. Technical note. Washington, DC: World Resources Institute.
1.3 - Blue Water Scarcity (score)	4.88	The blue water scarcity risk indicator is based on Mekonnen and Hoekstra (2016) global assessment of blue water scarcity on a monthly basis and at high spatial resolution (grid cells of 30 × 30 arc min resolution). Blue water scarcity is calculated as the ratio of the blue water footprint in a grid cell to the total blue water availability in the cell. The time period analyzed in this study ranges from 1996 to 2005.	Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. Science advances, 2(2), e1500323.
1.3 - Blue Water Scarcity (rank)	14	The blue water scarcity risk indicator is based on Mekonnen and Hoekstra (2016) global assessment of blue water scarcity on a monthly basis and at high spatial resolution (grid cells of 30 × 30 arc min resolution). Blue water scarcity is calculated as the ratio of the blue water footprint in a grid cell to the total blue water availability in the cell. The time period analyzed in this study ranges from 1996 to 2005.	Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. Science advances, 2(2), e1500323.
1.4 - Projected Change in Water Discharge (by ~2050) (score)	2.63	This risk indicator is based on multi-model simulation that applies both global climate and hydrological models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP). To estimate the change at 2°C of global warming above 1980-2010 levels, simulated annual water discharge was averaged over a 31-year period with 2°C mean warming. Results are expressed in terms of relative change (%) in probability between present day (1980-2010) conditions and 2°C scenarios by 2050.	Schewe, J., Heinke, J., Gerten, D., Haddeland, I., Arnell, N. W., Clark, D. B., ... & Gosling, S. N. (2014). Multimodel assessment of water scarcity under climate change. Proceedings of the National Academy of Sciences, 111(9), 3245-3250.
1.4 - Projected Change in Water Discharge (by ~2050) (rank)	36	This risk indicator is based on multi-model simulation that applies both global climate and hydrological models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP). To estimate the change at 2°C of global warming above 1980-2010 levels, simulated annual water discharge was averaged over a 31-year period with 2°C mean warming. Results are expressed in terms of relative change (%) in probability between present day (1980-2010) conditions and 2°C scenarios by 2050.	Schewe, J., Heinke, J., Gerten, D., Haddeland, I., Arnell, N. W., Clark, D. B., ... & Gosling, S. N. (2014). Multimodel assessment of water scarcity under climate change. Proceedings of the National Academy of Sciences, 111(9), 3245-3250.

Indicator	Value	Description	Source
1.5 - Drought Frequency Probability (score)	4.91	This risk indicator is based on the Standardized Precipitation and Evaporation Index (SPEI). Vicente-Serrano et al. (2010) developed this multi-scalar drought index applying both precipitation and temperature data to detect, monitor and analyze different drought types and impacts in the context of global warming. The mathematical calculations used for SPEI are similar to the Standard Precipitation Index (SPI), but it has the advantage to include the role of evapotranspiration.	Vicente-Serrano, S. M., Beguería, S., & López-Moreno, J. I. (2010). A multiscalar drought index sensitive to global warming: the standardized precipitation evapotranspiration index. Journal of climate, 23(7), 1696-1718.
1.5 - Drought Frequency Probability (rank)	11	This risk indicator is based on the Standardized Precipitation and Evaporation Index (SPEI). Vicente-Serrano et al. (2010) developed this multi-scalar drought index applying both precipitation and temperature data to detect, monitor and analyze different drought types and impacts in the context of global warming. The mathematical calculations used for SPEI are similar to the Standard Precipitation Index (SPI), but it has the advantage to include the role of evapotranspiration.	Vicente-Serrano, S. M., Beguería, S., & López-Moreno, J. I. (2010). A multiscalar drought index sensitive to global warming: the standardized precipitation evapotranspiration index. Journal of climate, 23(7), 1696-1718.
1.6 - Projected Change in Drought Occurrence (by ~2050) (score)	3.10	This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP) . A drought threshold for pre-industrial conditions was calculated based on time-series averages. Results are expressed in terms of relative change (%) in probability between pre-industrial and 2°C scenarios.	Frieler, K., Lange, S., Piontek, F., Reyer, C. P., Schewe, J., Warszawski, L., ... & Geiger, T. (2017). Assessing the impacts of 1.5 C global warming–simulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b). Geoscientific Model Development.
1.6 - Projected Change in Drought Occurrence (by ~2050) (rank)	52	This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP) . A drought threshold for pre-industrial conditions was calculated based on time-series averages. Results are expressed in terms of relative change (%) in probability between pre-industrial and 2°C scenarios.	Frieler, K., Lange, S., Piontek, F., Reyer, C. P., Schewe, J., Warszawski, L., ... & Geiger, T. (2017). Assessing the impacts of 1.5 C global warming–simulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b). Geoscientific Model Development.
2.1 - Estimated Flood Occurrence (score)	3.01	This risk indicator is based on the recurrence of floods within the 34-year time frame period of 1985 to 2019. The occurrence of floods within a given location was estimated using data from Flood Observatory, University of Colorado. The Flood Observatory use data derived from a wide variety of news, governmental, instrumental, and remote sensing source.	Brakenridge, G. R. (2019). Global active archive of large flood events. Dartmouth Flood Observatory, University of Colorado.
2.1 - Estimated Flood Occurrence (rank)	107	This risk indicator is based on the recurrence of floods within the 34-year time frame period of 1985 to 2019. The occurrence of floods within a given location was estimated using data from Flood Observatory, University of Colorado. The Flood Observatory use data derived from a wide variety of news, governmental, instrumental, and remote sensing source.	Brakenridge, G. R. (2019). Global active archive of large flood events. Dartmouth Flood Observatory, University of Colorado.

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2.2 - Projected Change in Flood Occurrence (by ~2050) (score)	2.84	This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP). The magnitude of the flood event was defined based on 100-year return period for pre-industrial conditions. Results are expressed in terms of change (%) in probability between pre-industrial and 2°C scenarios.	Frieler, K., Lange, S., Piontek, F., Reyer, C. P., Schewe, J., Warszawski, L., ... & Geiger, T. (2017). Assessing the impacts of 1.5 C global warming–simulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b). Geoscientific Model Development.
2.2 - Projected Change in Flood Occurrence (by ~2050) (rank)	56	This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP). The magnitude of the flood event was defined based on 100-year return period for pre-industrial conditions. Results are expressed in terms of change (%) in probability between pre-industrial and 2°C scenarios.	Frieler, K., Lange, S., Piontek, F., Reyer, C. P., Schewe, J., Warszawski, L., ... & Geiger, T. (2017). Assessing the impacts of 1.5 C global warming–simulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b). Geoscientific Model Development.
3.1 - Surface Water Contamination Index (score)	4.58	The underlying data for this risk indicator is based on a broad suite of pollutants with well-documented direct or indirect negative effects on water security for both humans and freshwater biodiversity, compiled by Vörösmarty et al. (2010). The negative effects are specific to individual pollutants, ranging from impacts mediated by eutrophication such as algal blooms and oxygen depletion (e.g., caused by phosphorus and organic loading) to direct toxic effects (e.g., caused by pesticides, mercury). The overall Surface Water Contamination Index is calculated based on a range of key pollutants with different weightings according to the level of their negative effects on water security for both humans and freshwater biodiversity: soil salinization (8%), nitrogen (12%) and phosphorus (P, 13%) loading, mercury deposition (5%), pesticide loading (10%), sediment loading (17%), organic loading (as Biological Oxygen Demand, BOD; 15%), potential acidification (9%), and thermal alteration (11%).	Vörösmarty, C. J., McIntyre, P. B., Gessner, M. O., Dudgeon, D., Prusevich, A., Green, P., ... & Davies, P. M. (2010). Global threats to human water security and river biodiversity. Nature, 467(7315), 555.

Indicator	Value	Description	Source
3.1 - Surface Water Contamination Index (rank)	3	The underlying data for this risk indicator is based on a broad suite of pollutants with well-documented direct or indirect negative effects on water security for both humans and freshwater biodiversity, compiled by Vörösmarty et al. (2010). The negative effects are specific to individual pollutants, ranging from impacts mediated by eutrophication such as algal blooms and oxygen depletion (e.g., caused by phosphorus and organic loading) to direct toxic effects (e.g., caused by pesticides, mercury). The overall Surface Water Contamination Index is calculated based on a range of key pollutants with different weightings according to the level of their negative effects on water security for both humans and freshwater biodiversity: soil salinization (8%), nitrogen (12%) and phosphorus (P, 13%) loading, mercury deposition (5%), pesticide loading (10%), sediment loading (17%), organic loading (as Biological Oxygen Demand, BOD; 15%), potential acidification (9%), and thermal alteration (11%).	Vörösmarty, C. J., McIntyre, P. B., Gessner, M. O., Dudgeon, D., Prusevich, A., Green, P., ... & Davies, P. M. (2010). Global threats to human water security and river biodiversity. Nature, 467(7315), 555.
4.1 - Fragmentation Status of Rivers (score)	1.60	This risk indicator is based on the data set by Grill et al. (2019) mapping the world's free-flowing rivers. Grill et al. (2019) compiled a geometric network of the global river system and associated attributes, such as hydro-geometric properties, as well as pressure indicators to calculate an integrated connectivity status index (CSI). While only rivers with high levels of connectivity in their entire length are classified as free-flowing, rivers of CSI < 95% are considered as fragmented at a certain degree.	Grill, G., Lehner, B., Thieme, M., Geenen, B., Tickner, D., Antonelli, F., ... & Macedo, H. E. (2019). Mapping the world's free-flowing rivers. Nature, 569(7755), 215.
4.1 - Fragmentation Status of Rivers (rank)	154	This risk indicator is based on the data set by Grill et al. (2019) mapping the world's free-flowing rivers. Grill et al. (2019) compiled a geometric network of the global river system and associated attributes, such as hydro-geometric properties, as well as pressure indicators to calculate an integrated connectivity status index (CSI). While only rivers with high levels of connectivity in their entire length are classified as free-flowing, rivers of CSI < 95% are considered as fragmented at a certain degree.	Grill, G., Lehner, B., Thieme, M., Geenen, B., Tickner, D., Antonelli, F., ... & Macedo, H. E. (2019). Mapping the world's free-flowing rivers. Nature, 569(7755), 215.
4.2 - Catchment Ecosystem Services Degradation Level (tree cover loss) (score)	1.00	For this risk indicator, tree cover loss was applied as a proxy to represent catchment ecosystem services degradation since forests play an important role in terms of water regulation, supply and pollution control. The forest cover data is based on Hansen et al.'s global Landsat data at a 30-meter spatial resolution to characterize forest cover and change. The authors defined trees as vegetation taller than 5 meters in height, and forest cover loss as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000 – 2018.	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A. A., Tyukavina, A., ... & Kommareddy, A. (2013). High-resolution global maps of 21st-century forest cover change. science, 342(6160), 850-853.

Indicator	Value	Description	Source
4.2 - Catchment Ecosystem Services Degradation Level (tree cover loss) (rank)	154	For this risk indicator, tree cover loss was applied as a proxy to represent catchment ecosystem services degradation since forests play an important role in terms of water regulation, supply and pollution control. The forest cover data is based on Hansen et al.'s global Landsat data at a 30-meter spatial resolution to characterize forest cover and change. The authors defined trees as vegetation taller than 5 meters in height, and forest cover loss as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000 – 2018.	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A. A., Tyukavina, A., ... & Kommareddy, A. (2013). High-resolution global maps of 21st-century forest cover change. science, 342(6160), 850-853.
4.3 - Projected Impacts on Freshwater Biodiversity (score)	2.39	The study by Tedesco et al. (2013) to project changes [% increase or decrease] in extinction rate by ~2090 of freshwater fish due to water availability loss from climate change is used as a proxy to estimate the projected impacts on freshwater biodiversity.	Tedesco, P. A., Oberdorff, T., Cornu, J. F., Beauchard, O., Brosse, S., Dürr, H. H., ... & Hugueny, B. (2013). A scenario for impacts of water availability loss due to climate change on riverine fish extinction rates. Journal of Applied Ecology, 50(5), 1105-1115.
4.3 - Projected Impacts on Freshwater Biodiversity (rank)	97	The study by Tedesco et al. (2013) to project changes [% increase or decrease] in extinction rate by ~2090 of freshwater fish due to water availability loss from climate change is used as a proxy to estimate the projected impacts on freshwater biodiversity.	Tedesco, P. A., Oberdorff, T., Cornu, J. F., Beauchard, O., Brosse, S., Dürr, H. H., ... & Hugueny, B. (2013). A scenario for impacts of water availability loss due to climate change on riverine fish extinction rates. Journal of Applied Ecology, 50(5), 1105-1115.
5.1 - Freshwater Policy Status (SDG 6.5.1) (score)	3.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National Water Resources Policy" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
5.1 - Freshwater Policy Status (SDG 6.5.1) (rank)	38	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National Water Resources Policy" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
5.2 - Freshwater Law Status (SDG 6.5.1) (score)	3.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National Water Resources Law(s)" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.

Indicator	Value	Description	Source
5.2 - Freshwater Law Status (SDG 6.5.1) (rank)	45	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation “National Water Resources Law(s)” indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
5.3 - Implementation Status of Water Management Plans (SDG 6.5.1) (score)	3.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation “National IWRM plans” indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
5.3 - Implementation Status of Water Management Plans (SDG 6.5.1) (rank)	49	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation “National IWRM plans” indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
6.1 - Corruption Perceptions Index (score)	4.00	This risk Indicator is based on the latest Transparency International’s data: the Corruption Perceptions Index 2018. This index aggregates data from a number of different sources that provide perceptions of business people and country experts on the level of corruption in the public sector.	Transparency International (2019). Corruption Perceptions Index 2018. Berlin: Transparency International.
6.1 - Corruption Perceptions Index (rank)	19	This risk Indicator is based on the latest Transparency International’s data: the Corruption Perceptions Index 2018. This index aggregates data from a number of different sources that provide perceptions of business people and country experts on the level of corruption in the public sector.	Transparency International (2019). Corruption Perceptions Index 2018. Berlin: Transparency International.
6.2 - Freedom in the World Index (score)	3.00	This risk indicator is based on Freedom House (2019), an annual global report on political rights and civil liberties, composed of numerical ratings and descriptive texts for each country and a select group of territories. The 2019 edition involved more than 100 analysts and more than 30 advisers with global, regional, and issue-based expertise to covers developments in 195 countries and 14 territories from January 1, 2018, through December 31, 2018.	Freedom House (2019). Freedom in the world 2019. Washington, DC: Freedom House.

Indicator	Value	Description	Source
6.2 - Freedom in the World Index (rank)	60	This risk indicator is based on Freedom House (2019), an annual global report on political rights and civil liberties, composed of numerical ratings and descriptive texts for each country and a select group of territories. The 2019 edition involved more than 100 analysts and more than 30 advisers with global, regional, and issue-based expertise to covers developments in 195 countries and 14 territories from January 1, 2018, through December 31, 2018.	Freedom House (2019). Freedom in the world 2019. Washington, DC: Freedom House.
6.3 - Business Participation in Water Management (SDG 6.5.1) (score)	1.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation “Business Participation in Water Resources Development, Management and Use” indicator, which corresponds to one of the six national level indicators under the Institutions and Participation category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
6.3 - Business Participation in Water Management (SDG 6.5.1) (rank)	139	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation “Business Participation in Water Resources Development, Management and Use” indicator, which corresponds to one of the six national level indicators under the Institutions and Participation category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
7.1 - Management Instruments for Water Management (SDG 6.5.1) (score)	3.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation “Sustainable and efficient water use management” indicator, which corresponds to one of the five national level indicators under the Management Instruments category. For SDG 6.5.1, management instruments refer to the tools and activities that enable decision-makers and users to make rational and informed choices between alternative actions.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
7.1 - Management Instruments for Water Management (SDG 6.5.1) (rank)	27	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation “Sustainable and efficient water use management” indicator, which corresponds to one of the five national level indicators under the Management Instruments category. For SDG 6.5.1, management instruments refer to the tools and activities that enable decision-makers and users to make rational and informed choices between alternative actions.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.

Indicator	Value	Description	Source
7.2 - Groundwater Monitoring Data Availability and Management (score)	3.00	This risk indicator is based on the data set by UN IGRAC (2019) to determine the level of availability of groundwater monitoring data at country level as groundwater management decisions rely strongly on data availability. The level of groundwater monitoring data availability for groundwater management is determined according to a combination of three criteria developed by WWF and IGRAC: 1) Status of country groundwater monitoring programme, 2) groundwater data availability for NGOs and 3) Public access to processed groundwater monitoring data.	UN IGRAC (2019). Global Groundwater Monitoring Network GGMN Portal. UN International Groundwater Resources Assessment Centre (IGRAC).
7.2 - Groundwater Monitoring Data Availability and Management (rank)	30	This risk indicator is based on the data set by UN IGRAC (2019) to determine the level of availability of groundwater monitoring data at country level as groundwater management decisions rely strongly on data availability. The level of groundwater monitoring data availability for groundwater management is determined according to a combination of three criteria developed by WWF and IGRAC: 1) Status of country groundwater monitoring programme, 2) groundwater data availability for NGOs and 3) Public access to processed groundwater monitoring data.	UN IGRAC (2019). Global Groundwater Monitoring Network GGMN Portal. UN International Groundwater Resources Assessment Centre (IGRAC).
7.3 - Density of Runoff Monitoring Stations (score)	3.21	The density of monitoring stations for water quantity was applied as proxy to develop this risk indicator. The Global Runoff Data Base was used to estimate the number of monitoring stations per 1000km2 of the main river system (data base access date: May 2018).	BfG (2019). Global Runoff Data Base. German Federal Institute of Hydrology (BfG).
7.3 - Density of Runoff Monitoring Stations (rank)	102	The density of monitoring stations for water quantity was applied as proxy to develop this risk indicator. The Global Runoff Data Base was used to estimate the number of monitoring stations per 1000km2 of the main river system (data base access date: May 2018).	BfG (2019). Global Runoff Data Base. German Federal Institute of Hydrology (BfG).
8.1 - Access to Safe Drinking Water (score)	5.00	This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.	WHO & UNICEF (2019). Estimates on the use of water, sanitation and hygiene by country (2000-2017). Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.
8.1 - Access to Safe Drinking Water (rank)	2	This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.	WHO & UNICEF (2019). Estimates on the use of water, sanitation and hygiene by country (2000-2017). Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.
8.2 - Access to Sanitation (score)	5.00	This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.	WHO & UNICEF (2019). Estimates on the use of water, sanitation and hygiene by country (2000-2017). Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.

Indicator	Value	Description	Source
8.2 - Access to Sanitation (rank)	6	This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.	WHO & UNICEF (2019). Estimates on the use of water, sanitation and hygiene by country (2000-2017). Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.
8.3 - Financing for Water Resource Development and Management (SDG 6.5.1) (score)	3.00	This risk indicator is based on the average 'Financing' score of UN SDG 6.5.1. Degree of IWRM Implementation database. UN SDG 6.5.1 database contains a category on financing which assesses different aspects related to budgeting and financing made available and used for water resources development and management from various sources.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
8.3 - Financing for Water Resource Development and Management (SDG 6.5.1) (rank)	65	This risk indicator is based on the average 'Financing' score of UN SDG 6.5.1. Degree of IWRM Implementation database. UN SDG 6.5.1 database contains a category on financing which assesses different aspects related to budgeting and financing made available and used for water resources development and management from various sources.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
9.1 - Cultural Diversity (score)	3.00	Water is a social and cultural good. The cultural diversity risk indicator was included in order to acknowledge that businesses face reputational risk due to the importance of freshwater for indigenous and traditional people in their daily life, religion and culture. This risk indicator is based on Oviedo and Larsen (2000) data set, which mapped the world's ethnolinguistic groups onto the WWF map of the world's ecoregions. This cross-mapping showed for the very first time the significant overlap that exists between the global geographic distribution of biodiversity and that of linguistic diversity.	Oviedo, G., Maffi, L., & Larsen, P. B. (2000). Indigenous and traditional peoples of the world and ecoregion conservation: An integrated approach to conserving the world's biological and cultural diversity. Gland: WWF (World Wide Fund for Nature) International.
9.1 - Cultural Diversity (rank)	30	Water is a social and cultural good. The cultural diversity risk indicator was included in order to acknowledge that businesses face reputational risk due to the importance of freshwater for indigenous and traditional people in their daily life, religion and culture. This risk indicator is based on Oviedo and Larsen (2000) data set, which mapped the world's ethnolinguistic groups onto the WWF map of the world's ecoregions. This cross-mapping showed for the very first time the significant overlap that exists between the global geographic distribution of biodiversity and that of linguistic diversity.	Oviedo, G., Maffi, L., & Larsen, P. B. (2000). Indigenous and traditional peoples of the world and ecoregion conservation: An integrated approach to conserving the world's biological and cultural diversity. Gland: WWF (World Wide Fund for Nature) International.
10.1 - Freshwater Endemism (score)	1.15	The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Companies operating in basins with higher number of endemic fish species are exposed to higher reputational risks.	WWF & TNC (2015). Freshwater Ecoregions of the World.

Country Overview - Niger

Indicator	Value	Description	Source
10.1 - Freshwater Endemism (rank)	191	The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Companies operating in basins with higher number of endemic fish species are exposed to higher reputational risks.	WWF & TNC (2015). Freshwater Ecoregions of the World.
10.2 - Freshwater Biodiversity Richness (score)	1.37	The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Count of fish species is used as a representation of freshwater biodiversity richness. Companies operating in basins with higher number of fish species are exposed to higher reputational risks.	WWF & TNC (2015). Freshwater Ecoregions of the World.
10.2 - Freshwater Biodiversity Richness (rank)	180	The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Count of fish species is used as a representation of freshwater biodiversity richness. Companies operating in basins with higher number of fish species are exposed to higher reputational risks.	WWF & TNC (2015). Freshwater Ecoregions of the World.
11.1 - National Media Coverage (score)	3.00	This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware local residents typically are of water-related issues due to national media coverage. The status of the river basin (e.g., scarcity and pollution) is taken into account, as well as the importance of water for livelihoods (e.g., food and shelter).	WWF & Tecnoma (TYPSA Group)
11.1 - National Media Coverage (rank)	67	This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware local residents typically are of water-related issues due to national media coverage. The status of the river basin (e.g., scarcity and pollution) is taken into account, as well as the importance of water for livelihoods (e.g., food and shelter).	WWF & Tecnoma (TYPSA Group)
11.2 - Global Media Coverage (score)	1.00	This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware people are of water-related issues due to global media coverage. Familiarity to and media coverage of the region and regional water-related disasters are taken into account.	WWF & Tecnoma (TYPSA Group)
11.2 - Global Media Coverage (rank)	153	This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware people are of water-related issues due to global media coverage. Familiarity to and media coverage of the region and regional water-related disasters are taken into account.	WWF & Tecnoma (TYPSA Group)

Country Overview - Niger

Indicator	Value	Description	Source
12.1 - Conflict News Events (RepRisk) (score)	3.00	This risk indicator is based on 2018 data collected by RepRisk on counts and registers of documented negative incidents, criticism and controversies that can affect a company's reputational risk. These negative news events are labelled per country and industry class.	RepRisk & WWF (2019). Due diligence database on ESG and business conduct risks. RepRisk.
12.1 - Conflict News Events (RepRisk) (rank)	62	This risk indicator is based on 2018 data collected by RepRisk on counts and registers of documented negative incidents, criticism and controversies that can affect a company's reputational risk. These negative news events are labelled per country and industry class.	RepRisk & WWF (2019). Due diligence database on ESG and business conduct risks. RepRisk.
12.2 - Hydro-political Risk (score)	2.62	This risk indicator is based on the assessment of hydro-political risk by Farinosi et al. (2018). More specifically, it is based on the results of spatial modelling by Farinosi et al. (2018) that determined the main parameters affecting water cross-border conflicts and calculated the likelihood of hydro-political issues.	Farinosi, F., Giupponi, C., Reynaud, A., Ceccherini, G., Carmona-Moreno, C., De Roo, A., ... & Bidoglio, G. (2018). An innovative approach to the assessment of hydro-political risk: A spatially explicit, data driven indicator of hydro-political issues. Global environmental change, 52, 286-313.
12.2 - Hydro-political Risk (rank)	71	This risk indicator is based on the assessment of hydro-political risk by Farinosi et al. (2018). More specifically, it is based on the results of spatial modelling by Farinosi et al. (2018) that determined the main parameters affecting water cross-border conflicts and calculated the likelihood of hydro-political issues.	Farinosi, F., Giupponi, C., Reynaud, A., Ceccherini, G., Carmona-Moreno, C., De Roo, A., ... & Bidoglio, G. (2018). An innovative approach to the assessment of hydro-political risk: A spatially explicit, data driven indicator of hydro-political issues. Global environmental change, 52, 286-313.
Population, total (#)	20672987	Population, total	The World Bank 2018, Data , hompage accessed 20/04/2018
GDP (current US$)	0	GDP (current US$)	The World Bank 2018, Data , hompage accessed 20/04/2018
EPI 2018 score (0-100)	35.74	Environmental Performance Index	
WGI -Voice and Accountability (0-100)	11.90	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132

Water Risk Filter

Country Overview - Niger

Indicator	Value	Description	Source
WGI -Political stability no violence (0-100)	34.48	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132
WGI - Government Effectiveness (0-100)	31.25	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132
WGI - Regulatory Quality (0-100)	26.44	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132
WGI - Rule of Law (0-100)	29.81	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132
WGI - Control of Corruption (0-100)	31.25	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132

Country Overview - Niger

Indicator	Value	Description	Source
WRI BWS all industries (0-5)	0.11	WRI Baseline Water Stress (BWS)	Gassert, F., P. Reig, T. Luo, and A. Maddocks. 2013. "Aqueduct country and river basin rankings: a weighted aggregation of spatially distinct hydrological indicators." Working paper. Washington, DC: World Resources Institute, December 2013. Available online at http://wri.org/publication/aqueduct-country-river-basin-rankings.
WRI BWS Ranking (1=very high)	158	WRI Baseline Water Stress (BWS)	Gassert, F., P. Reig, T. Luo, and A. Maddocks. 2013. "Aqueduct country and river basin rankings: a weighted aggregation of spatially distinct hydrological indicators." Working paper. Washington, DC: World Resources Institute, December 2013. Available online at http://wri.org/publication/aqueduct-country-river-basin-rankings.
Baseline Water Stress (BWS) - 2020 BAU (1=very high)	140	WRI country ranking	Luo, T., R. Young, and P. Reig. 2015. "Aqueduct projected water stress rankings." Technical note. Washington, DC: World Resources Institute, August 215. Available online at http://www.wri.org/publication/aqueduct-projected-water-stress-country-rankings.
Baseline Water Stress (BWS) - 2020 Optimistic (increasing rank describes lower risk)	140	WRI country ranking	Luo, T., R. Young, and P. Reig. 2015. "Aqueduct projected water stress rankings." Technical note. Washington, DC: World Resources Institute, August 215. Available online at http://www.wri.org/publication/aqueduct-projected-water-stress-country-rankings.
Baseline Water Stress (BWS) - 2020 Pessimistic (increasing rank describes lower risk)	140	WRI country ranking	Luo, T., R. Young, and P. Reig. 2015. "Aqueduct projected water stress rankings." Technical note. Washington, DC: World Resources Institute, August 215. Available online at http://www.wri.org/publication/aqueduct-projected-water-stress-country-rankings.

Water Risk Filter

Country Overview - Niger

Indicator	Value	Description	Source
Baseline Water Stress (BWS) - 2030 BAU (increasing rank describes lower risk)	139	WRI country ranking	Luo, T., R. Young, and P. Reig. 2015. "Aqueduct projected water stress rankings." Technical note. Washington, DC: World Resources Institute, August 215. Available online at http://www.wri.org/publication/aqueduct-projected-water-stress-country-rankings.
Baseline Water Stress (BWS) - 2030 Optimistic (increasing rank describes lower risk)	139	WRI country ranking	Luo, T., R. Young, and P. Reig. 2015. "Aqueduct projected water stress rankings." Technical note. Washington, DC: World Resources Institute, August 215. Available online at http://www.wri.org/publication/aqueduct-projected-water-stress-country-rankings.
Baseline Water Stress (BWS) - 2030 Pessimistic (increasing rank describes lower risk)	139	WRI country ranking	Luo, T., R. Young, and P. Reig. 2015. "Aqueduct projected water stress rankings." Technical note. Washington, DC: World Resources Institute, August 215. Available online at http://www.wri.org/publication/aqueduct-projected-water-stress-country-rankings.
Baseline Water Stress (BWS) - 2040 BAU (increasing rank describes lower risk)	143	WRI country ranking	Luo, T., R. Young, and P. Reig. 2015. "Aqueduct projected water stress rankings." Technical note. Washington, DC: World Resources Institute, August 215. Available online at http://www.wri.org/publication/aqueduct-projected-water-stress-country-rankings.
Baseline Water Stress (BWS) - 2040 Optimistic (increasing rank describes lower risk)	143	WRI country ranking	Luo, T., R. Young, and P. Reig. 2015. "Aqueduct projected water stress rankings." Technical note. Washington, DC: World Resources Institute, August 215. Available online at http://www.wri.org/publication/aqueduct-projected-water-stress-country-rankings.
Baseline Water Stress (BWS) - 2040 Pessimistic (increasing rank describes lower risk)	139	WRI country ranking	Luo, T., R. Young, and P. Reig. 2015. "Aqueduct projected water stress rankings." Technical note. Washington, DC: World Resources Institute, August 215. Available online at http://www.wri.org/publication/aqueduct-projected-water-stress-country-rankings.

Water Risk Filter

Country Overview - Niger

Indicator	Value	Description	Source
Total water footprint of national consumption (m3/a/cap)	3518.70	WFN Water Footprint Data	Mekonnen, M.M. and Hoekstra, A.Y. (2011) National water footprint accounts: The green, blue and grey water footprint of production and consumption, Value of Water Research Report Series No. 50, UNESCO-IHE, Delft, the Netherlands.http://www.waterfootprint.org/Reports/Report50-NationalWaterFootprints-Vol1.pdf
Ratio external / total water footprint (%)	2.55	WFN Water Footprint Data	Mekonnen, M.M. and Hoekstra, A.Y. (2011) National water footprint accounts: The green, blue and grey water footprint of production and consumption, Value of Water Research Report Series No. 50, UNESCO-IHE, Delft, the Netherlands.http://www.waterfootprint.org/Reports/Report50-NationalWaterFootprints-Vol1.pdf
Area equipped for full control irrigation: total (1000 ha)	13.74	Aquastat - Irrigation	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Area equipped for irrigation: total (1000 ha)	99.89	Aquastat - Irrigation	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
% of the area equipped for irrigation actually irrigated (%)	87.97	Aquastat - Irrigation	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Electricity production from hydroelectric sources (% of total)	0.00	World Development Indicators	The World Bank 2018, Data , hompage accessed 20/04/2018
Total internal renewable water resources (IRWR) (10^9 m3/year)	3.50	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Total internal renewable water resources (IRWR) (10^9 m3/year)	30.55	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Water resources: total external renewable (10^9 m3/year)	3.50	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13

Country Overview - Niger

Indicator	Value	Description	Source
Total renewable water resources (10^9 m3/year)	34.05	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Dependency ratio (%)	89.72	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Total renewable water resources per capita (m3/inhab/year)	1711.00	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
World happiness [0-8]	4.17	WorldHappinessReport.org	World Happiness Report, homepage accessed 20/04/2018

Country Aspects

1. PHYSICAL ASPECTS

1.1. WATER RESOURCES

1.1.1. WATER RESOURCES

Niger depends on external sources for nearly 90 per cent of its water. The 550km-long River Niger is the only permanent river in the country. It crosses the southwest from the border with Mali and Nigeria to Benin, then flows to a large plain cut by dry valleys. Finally, the Niger meets the major, cross-border Irhazer Lullemeden and Chad basins.

Renewable water resources are generally estimated at 33.65km3/yr, of which 31.15km3 is surface water and 2.5km3 is groundwater. Weather conditions are arid and semi-arid over most parts of the country. This means renewable water resources are very irregular. Only a portion of renewable resources are actually usable by Niger for technical, economic, environmental and geopolitical reasons. The share regularly available (around 90 per cent of the time) of surface and groundwater is only 5km3/yr.

According to IRIN (2006), Niger has an estimated 2.5 billion m3 of underground renewable water. But only 20 per cent of this is currently exploited, according to UNICEF. In addition to its underground water sources, Niger also has the Niger River, the Komadougou River and Lake Chad. About 29km3/yr of surface water flows in the Niger River. There are fluctuations in flow volume due to weather conditions ("cycles" of drought). Thus, the average volume of the River Niger in Niamey from 1929 to 1991 was 28km3/yr, or 32km3/yr from 1929 to 1968 and 23km3/yr from 1969 to 1991. In addition, evaporation causes losses, while seepage losses are limited.

In the far east, Lake Chad has withdrawn more and more, disappearing inside the borders of Niger in 2004, leaving only the Komadougou Yobe as an intermittent source of surface water. Since the late 1970s, this body of water has considerably decreased, due to fewer contributions from the Chari and less rain.

Niger has about 20 dams of medium capacity, allowing the storage of 0.1km3 of water. Silt increases the risk of water shortages. Measurements of sediment transport give concentrations ranging from 10.5-52g/L and specific degradation of 2,100-4,200 tonnes/km2 per year. Thus the dams of the Maggia Ader Doutchi have lost 13 to 80 per cent of capacity in less than 15 years.

The total volume of renewable groundwater resources is estimated at between 2.5 and 4.4km3/yr. The major aquifers are:

-Alluvial aquifers, particularly the Goulbi Maradi, those of the valleys of the Air and Kori Teloua, Koris, the area of the Ader-Doutchi-Maggia, the Dallol Bosso, Maouri Foga, the Komadougou and Koram;

-Discontinuous bedrock aquifers, especially Liptako and Damagaram-Mounio;

-Aquifers of the Continental Terminal and Continental Hamadien;

-The water of the Pliocene of the Lake Chad Basin;

-Manga of the water table in the Lake Chad Basin;

-The Sandstone Aquifer of Agadez.

Niger has significant wetlands, but only 2,200km2 are protected and registered under the Ramsar Convention. The lack of rain in the past 20 years has led to the destruction of natural vegetation and reduced agricultural productivity.

1.1.2. WATER USE

In 1988, 8 per cent of Niger's drinking water came from surface water sources and 92 per cent from groundwater. Agriculture uses 95 per cent of all water, or 2,080 million m3 in 2000. Domestic and industrial consumption amounted respectively to 94 and 12 million m3.

Nearly 80 per cent of people rely on subsistence farming as their main food source. In the past, seasonal monsoons provided enough water for farmers to plant and harvest sufficient crops to last them through the year. However, rainfall in the region has decreased between 20 per cent and 50 per cent in the last 30 years, according to France's National Centre for Scientific Research. Several years of drought helped trigger the 2005 food crisis (IRIN, 2006).

Desertification has compounded the problem of poor precipitation. With lakes and ponds lacking replenishment and arable land being overcultivated, more and more of the country's fertile lakeside plains are transforming into barren deserts, with soil stripped of nutrients (IRIN, 2006).

The area around Lake Chad has suffered particularly badly from this phenomenon. Divided between Niger, Chad, Cameroon and Nigeria, the lake was once the fourth largest in Africa. It has shrunk dramatically since the 1960s. A study published in 2001 in the Journal of Geophysical Research concluded that in 40 years, Lake Chad had constricted from 25,000km2 to only 1,500km2 – a surface-area reduction of 94 per cent. The study attributed the drastic shift to changes in climate, as well as poor irrigation planning, which has diverted too much of the lake's water supply.

The shrinkage has stranded some communities far from the shores of the lake. N'guimi, for instance, located 1,500km east of Niamey and once a lakeside town, is now more than 100km from the lake (IRIN, 2006).

The areas surrounding the river, which include the regions of Tillaberi, Niamey and Dosso, are densely populated. Farmers have cultivated the fertile land for subsistence use, growing rice, millet, sorghum and cassava. Because they use archaic agricultural methods, however, harvests are poor (IRIN, 2006).

Only 540km2 of land in the Niger river basin is irrigated, although this could potentially be 2,220km2, according to the Food and Agriculture Organization of the United Nations (FAO). Developing the irrigation potential of the river would widely benefit local farmers and allow for the cultivation of robust commercial crops, including cotton, corn and groundnuts. In 2003, the FAO

showed local farmers how to improve their irrigation and cultivation techniques, and they produced cash-crop onions that were sold as far as 800km away in Cote d'Ivoire (IRIN, 2006).
The Niger River is 4,200km long and the basin covers around 1.5 million km2. Large populations of farmers, fishermen and pastoralists rely on the Niger River (WWF, 2009).
Local communities and other stakeholders in the Niger river basin are increasingly facing water shortages as well as problems with poor water quality and environmental degradation. The degradation of the ecosystem has exposed populations to water shortages and food insecurity (WWF, 2009).
These problems limit attempts to alleviate poverty and improve healthcare, food security, economic development and protection of natural resources. Degradation has also resulted in loss of habitat for millions of migratory birds, aquatic fauna and flora (WWF, 2009).
The main competing interests for water resources in the Niger River include the large-scale irrigation farmlands; small-scale farmers and pastoralists on both sides of the basin; the mining industry; small-scale fishing activities; and urban and rural domestic water supplies (WWF, 2009).
Loss of vegetation, unsustainable agricultural practices and pollution threats from urban settlements and invasive plants (for example, water hyacinth) cause further problems. All these constraints mean the Niger River is no longer able to provide goods and services for the local communities living it (WWF, 2009).

1.2. WATER QUALITY, ECOSYSTEMS AND HUMAN HEALTH

The proliferation of water hyacinth in the River Niger, an indicator of eutrophication, shows the degradation of water quality.
Waterborne diseases in people have reached alarming proportions. Almost a quarter of people suffer from bilharzia, an infection spread by swimming or bathing in water contaminated with urine and faeces, according to new research by Niger's Ministry of Health (IRIN, 2007).
Some 3 million of Niger's 13.4 million people have been diagnosed as suffering from the parasitic skin infection schistosomiasis. It causes rashes and flu-like symptoms, can create urinary problems and damage the bladder, liver, lungs, bowel and nervous system (IRIN, 2007).
The degradation of water quality in the Niger river basin is significant. The growth of large cities along the river's banks has not been accompanied by development of wastewater collection and treatment plants, whether for domestic or industrial wastewater. Picouet (1999) established a water sampling protocol for the soil and climate conditions found in Africa that allows him to analyze very low concentrations (in parts per billion) of trace elements in the waters of the Upper Niger. The enrichment factor calculated for these trace elements, compared with international standards, allows a preliminary estimate of contamination from anthropogenic sources. The results show that at any of the stations of the upper basin, titanium, aluminum, iron, zirconium, yttrium, strontium, lead, uranium, and vanadium can be considered as earth elements, coming from the weathering of silicate rocks (WB, 2005).
After crossing the Inland Delta, the Middle Niger River's total suspended soil (TSS) concentrations tend to increase as a result of harmattan dust and windblown sand coming from the dunes along the riverbanks. At Tossaye, TSS levels over 100mg/L can be expected. This trend extends for the entire reach of the Middle Niger. Very erosive floods from the semi-arid tributaries in Burkina Faso add suspended solids to these TSS concentrations. For example, the Gorouol, at Dolbel, has an average TSS of 750mg/L for a flow of 9m3 per second (1976-83, with five months without flow) and monthly concentrations exceeding 1,000mg/L. The Gorouol transported an average of 180,000 tonnes in the observation period, whereas the figure for Kandadji was 1.64 million tonnes (WB, 2005).
At Niamey, TSS concentrations again show an increase; data includes other years of observation and is not directly comparable to the data for Kandadji, but it shows the significance of the Burkina Faso tributaries, the Dargol and Sirba. Over the three years of measurement by Gallaire (1995) at the Niamey station, the annual TSS load was 3.5 million tonnes, which corresponds to the lowest value of TSS measured at this station (WB, 2005).

2. GOVERNANCE ASPECTS

2.1. WATER INSTITUTIONS

Administrations active in managing water and land are:
-The Ministry of Water, Environment and the fight against Desertification (MHE/LCD) is in charge of design, development and implementation of water-related policies; pollution control; environmental management; and drinking water supply everywhere apart from urban centres. It includes the Directorate of Water Resources, the Directorate of Water Infrastructure, the Department of Environment, the Directorate of Studies and Programming and the Office of Environmental Assessment and Impact Assessment. The MHE/LCD also oversees the implementation of the National Hydraulic Programme;
-The Ministry of Agricultural Development;
-The National Institute of Agronomic Research of Niger;
-The national irrigation schemes (Onah);
-The Ministry of Animal Resources;
-The High Commission for the development of the Niger valley, under the supervision of the Prime Minister;
-The National Environment Council for Sustainable Development, under the supervision of the Prime Minister, has the mission to develop, implement, monitor and evaluate the National Environmental Plan for Sustainable Development. It is mainly responsible for ensuring the consideration of the environmental dimension in Niger's socio-economic development policies and programmes.
The Société de Patrimoine des Eaux du Niger (SPEN) provides water supply to urban centres. It is a Crown corporation with legal and financial autonomy. The Société d'Exploitation des Eaux du Niger (SEEN) is a private company responsible for operating water services in 51 cities. The Niger Association for the Development of Private Irrigation promotes sustainable development of small-scale irrigation and thus the emergence of viable farms.

In 1996, the Niger government, with the World Bank's support, initiated a programme of economic liberalization which included a progressive disengagement of the state from a dozen public and para-public enterprises. The institutional reform of the water supply sector was part of this. The objective of the reform was to build an autonomous and financially viable urban water sub-sector that could ensure the delivery of safe water to urban centres at the lowest possible cost. Activities implemented under the reform included (World Bank, 2010):
•Water privatization, which materialized with the establishment of a public company, SPEN, and a private company, SEEN;
•The implementation of the Water Sector Project that would finance and support the reform;
•Support for the Multisectoral Regulatory Authority, established as an independent arbitrator between the actors.

2.2. WATER MANAGEMENT

In 1982, it was decided to entrust the management of cooperatives with facilities for all operators. Cooperatives were closely involved in making this decision. The mechanism has worked well. However, starting in 1990, with the deteriorating situation of public finances and the new landscape of political pluralism, the sustainability of the operation of facilities began to deteriorate, and development slowed in new areas. In 1992, Niger adopted a document called Guidelines for policy development for the Niger, which created of a system of management and maintenance for hydraulic structures and a means of drainage for the beneficiary communities.
From 1993, there were deep reforms in the water and sanitation sector. They provided:
-The development and adoption of master plans and management of water resources in 1993;
-Updating the master plan in 2000;
-The development and adoption of policies and strategies in the water and sanitation sector in 2001, accompanied by a National Hydraulic Programme.
Water access
Despite abundant fresh water resources, only 60 per cent of Niger's rural population has access to potable water. The figure is only slightly higher – 70 per cent – for the urban population, according to the MHE/LCD. Access to water has been an ongoing struggle for Niger, which is ranked as the globe's poorest country by the UN Development Programme. It has the highest birth rate in the world, with women bearing on average eight children. This rising population adds extra stress to an already short water supply (IRIN, 2006).
There are several other factors that have put Niger's water supply in a precarious state, such as poverty, environmental issues and poor infrastructure. This has resulted in devastating consequences for the population, including a severe hunger crisis in 2005 and life-threatening health problems, such as typhoid and diarrhoea (IRIN, 2006).
Urban waterUrban water
In 1999, the government initiated urban water sector reform to improve the technical and financial performance of the sector, with a view to: reducing operating costs; introducing private sector commercial management; increasing water coverage through the development of production and distribution systems and quality improvements; and reaching financial autonomy in the medium term to support implementation of investment programmes without resorting to government subsidies (WB, 2010).In 1999, the government initiated urban water sector reform to improve the technical and financial performance of the sector, with a view to: reducing operating costs; introducing private sector commercial management; increasing water coverage through the development of production and distribution systems and quality improvements; and reaching financial autonomy in the medium term to support implementation of investment programmes without resorting to government subsidies (WB, 2010).
The reforms were part of a global private sector participation programme (PSP) supported by the Privatization and Regulatory Reform Technical Assistance Project (WB, 2010).The reforms were part of a global private sector participation programme (PSP) supported by the Privatization and Regulatory Reform Technical Assistance Project (WB, 2010).
Following the lessons learned in other West African countries, a lease (affermage) contract was chosen as the appropriate PSP option. The new institutional framework involved four main actors:Following the lessons learned in other West African countries, a lease (affermage) contract was chosen as the appropriate PSP option. The new institutional framework involved four main actors:
-The government, responsible for defining sector policy, managing water resources and developing tariff policy (taking into account socio-economic constraints and the need for financial equilibrium in the sector);-The government, responsible for defining sector policy, managing water resources and developing tariff policy (taking into account socio-economic constraints and the need for financial equilibrium in the sector);
-The Multisector Regulatory Agency, responsible for developing a regulatory framework, monitoring urban water services and contractual arrangements among stakeholders;-The Multisector Regulatory Agency, responsible for developing a regulatory framework, monitoring urban water services and contractual arrangements among stakeholders;
-A public asset holding company, SPEN, responsible for investments;-A public asset holding company, SPEN, responsible for investments;
-A private operator, selected as SEEN after competitive bidding, in charge of delivering services.-A private operator, selected as SEEN after competitive bidding, in charge of delivering services.
SPEN and the government entered into a concession contract, complemented by a framework agreement designed to monitor their respective commitments to the development of services. SEEN entered into a 10-year lease contract with the government and SPEN, complemented by a performance contract (WB, 2010).SPEN and the government entered into a concession contract, complemented by a framework agreement designed to monitor their respective commitments to the development of services. SEEN entered into a 10-year lease contract with the government and SPEN, complemented by a performance contract (WB, 2010).
Rural WaterRural Water
The preparation in 1999-2000 of the Master Plan for the Development and Management of Water Resources (financed by UNDP) created an opportunity to formulate new basic principles for the

development of the sector. These were:The preparation in 1999-2000 of the Master Plan for the Development and Management of Water Resources (financed by UNDP) created an opportunity to formulate new basic principles for the development of the sector. These were:

-Water facilities should be owned and developed by water users;-Water facilities should be owned and developed by water users;

-Private sector and non-governmental organizations should assist communities in designing and operating facilities;-Private sector and non-governmental organizations should assist communities in designing and operating facilities;

-The regional offices of the MRE (Directions Départementales des Resources en Eau) should focus on implementing and monitoring the national water policy (WB, 2010).-The regional offices of the MRE (Directions Départementales des Resources en Eau) should focus on implementing and monitoring the national water policy (WB, 2010).

Traditionally, control and management of land lay with village chiefs, heads of provinces and groups of nomads who were custodians of a piece of land.Traditionally, control and management of land lay with village chiefs, heads of provinces and groups of nomads who were custodians of a piece of land.

-Ordinance No. 93-014 of 2 March 1993 on the water regime as amended by Law No. 98-041 of 7 December 1998, which aims to define and determine the water regime and conditions of use and protection of this resource;-Ordinance No. 93-014 of 2 March 1993 on the water regime as amended by Law No. 98-041 of 7 December 1998, which aims to define and determine the water regime and conditions of use and protection of this resource;

-Decree No. 97-368/PRN/MH/E, adopted 2 October 1997, which determines the mode of application of Order No. 93-014, and in particular the framework for managing water, public domain in underground streams, management, maintenance and operation of a public water point, water samples (ground and surface), protecting water quality, pollution sources and control methods, and responsibilities for the management of water management works;-Decree No. 97-368/PRN/MH/E, adopted 2 October 1997, which determines the mode of application of Order No. 93-014, and in particular the framework for managing water, public domain in underground streams, management, maintenance and operation of a public water point, water samples (ground and surface), protecting water quality, pollution sources and control methods, and responsibilities for the management of water management works;

-Ordinance No. 93-13 of 2 March 1993 establishing a code of public health for water, its pollution or protection;-Ordinance No. 93-13 of 2 March 1993 establishing a code of public health for water, its pollution or protection;

-Ordinance No. 93-15 of 2 March 1993 on the guiding principles of the Rural Code.-Ordinance No. 93-15 of 2 March 1993 on the guiding principles of the Rural Code.

-Ordinance No. 93-16 of 2 March 1993 Mining Law, which emphasizes in its first article that groundwater is “except as expressly provided in this Ordinance, a special system defined in other laws”;-Ordinance No. 93-16 of 2 March 1993 Mining Law, which emphasizes in its first article that groundwater is “except as expressly provided in this Ordinance, a special system defined in other laws”;

-Law No. 98-56 of 29 December 1998, which comprises framework law on environmental management;-Law No. 98-56 of 29 December 1998, which comprises framework law on environmental management;

-Ordinance No. 97-00L of 10 January 1997, institutionalizing impact assessment on the environment;-Ordinance No. 97-00L of 10 January 1997, institutionalizing impact assessment on the environment;

-Order No. 12 of 12 February 1999 on the maintenance of public works in rural areas.-Order No. 12 of 12 February 1999 on the maintenance of public works in rural areas.

The government eventually embodied the above-mentioned strategies in two Sector Policy Letters (one for the urban water sub-sector, one for the rural water sub-sector). These were issued on 8 March 2001. The letters reiterated the government’s commitment to the reforms’ objectives. The Urban Water Policy Letter also included action plans to ensure the viability of the sub-sector through: a series of measures to ensure timely and regular payment of water bills, and to reduce the water consumption of government agencies (the private operator would be authorized to disconnect Government agencies if they didn’t pay their bills); and gradual adjustment of water tariffs so that the sub-sector could achieve financial equilibrium by 2006.The government eventually embodied the above-mentioned strategies in two Sector Policy Letters (one for the urban water sub-sector, one for the rural water sub-sector). These were issued on 8 March 2001. The letters reiterated the government’s commitment to the reforms’ objectives. The Urban Water Policy Letter also included action plans to ensure the viability of the sub-sector through: a series of measures to ensure timely and regular payment of water bills, and to reduce the water consumption of government agencies (the private operator would be authorized to disconnect Government agencies if they didn’t pay their bills); and gradual adjustment of water tariffs so that the sub-sector could achieve financial equilibrium by 2006.

<h2>2.3.WATER POLICY AND LEGAL FRAMEWORK2.3.WATER POLICY AND LEGAL FRAMEWORK

3. GEOPOLITICAL ASPECTS

Most of the river water and groundwater used for irrigation is from shared resources. International agreements have been concluded to allow the establishment of structures to facilitate the rational management of these resources:

-Created in November 1980 by the Convention of Faranah, the Niger Basin Authority (NBA) is a regional organization of nine states bordering the River Niger. Its main functions are: the harmonization and coordination of national policies for the development of water resources; participation in development planning through the development and implementation of an integrated development plan; and joint participation in the design and operation of projects of common interest;

-The bilateral Memorandum of Understanding of 12 July 1988 with Mali, on cooperation in the use of water resources of the Niger River;

-On 18 July 1990, Niger and Nigeria signed a cooperation agreement to organize the management of their four major shared river basins (Maggia/Lamido, Gada/Goulbi Maradi, Tagwaï/El Fadama and the lower Yobe basin of Komadougou). The agreement, called Maiduguri, is on the "equitable sharing of the development, conservation and use of shared water resources". The results of this cooperation are to date very slim;

-Niger remains a member of the Commission of the Lake Chad Basin, established in 1964, despite the disappearance of the lake itself.

Niger shares Lake Chad and the Niger River with several countries, including Mali, Guinea, Nigeria, Benin, Cameroon and Chad. All these nations have a vested interest in the vital resources provided by these waterways (IRIN, 2006).

Recognising the need for cooperation, two bodies emerged to manage the growing problems faced by the people who rely on shared water sources for survival. Both the Niger Basin Authority and the Lake Chad Basin Commission work toward promoting the healthy development of Lake Chad and the Niger River so that all countries can benefit (IRIN, 2006).

In conjunction with international bodies, many projects have been implemented to try to alleviate some of the stresses that have been placed on these two crucial resources. The Niger Basin Initiative was launched to bring together WWF, the NBA, Wetlands International and the Nigerien Conservation Foundation for a two-year project to ensure that environmental concerns are considered when developing the basin (IRIN, 2006).

4. SOURCES

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