Water Risk Filter

Country Overview - Belize

Water Indicators

Indicator	Value	Description	Source
Overall Basin Risk (score)	2.18	Overall Basin Risk (score)	
Overall Basin Risk (rank)	173	Overall Basin Risk (rank)	
Physical risk (score)	1.94	Physical risk (score)	
Physical risk (rank)	171	Physical risk (rank)	
Regulatory risk (score)	3.05	Regulatory risk (score)	
Regulatory risk (rank)	61	Regulatory risk (rank)	
Reputation risk (score)	2.01	Reputation risk (score)	
Reputation risk (rank)	184	Reputation risk (rank)	
1. Quantity - Scarcity (score)	1.21	1. Quantity - Scarcity (score)	
1. Quantity - Scarcity (rank)	192	1. Quantity - Scarcity (rank)	
2. Quantity - Flooding (score)	3.76	2. Quantity - Flooding (score)	
2. Quantity - Flooding (rank)	60	2. Quantity - Flooding (rank)	
3. Quality (score)	1.89	3. Quality (score)	
3. Quality (rank)	158	3. Quality (rank)	
4. Ecosystem Service Status (score)	1.98	4. Ecosystem Service Status (score)	
4. Ecosystem Service Status (rank)	129	4. Ecosystem Service Status (rank)	
5. Enabling Environment (Policy & Laws) (score)	3.20	5. Enabling Environment (Policy & Laws) (score)	
5. Enabling Environment (Policy & Laws) (rank)	44	5. Enabling Environment (Policy & Laws) (rank)	
6. Institutions and Governance (score)	2.50	6. Institutions and Governance (score)	
6. Institutions and Governance (rank)	140	6. Institutions and Governance (rank)	
7. Management Instruments (score)	3.97	7. Management Instruments (score)	
7. Management Instruments (rank)	10	7. Management Instruments (rank)	
8 - Infrastructure & Finance (score)	2.30	8 - Infrastructure & Finance (score)	
8 - Infrastructure & Finance (rank)	84	8 - Infrastructure & Finance (rank)	
9. Cultural Diversity (score)	1.00	9. Cultural importance (score)	
9. Cultural Diversity (rank)	185	9. Cultural importance (rank)	
10. Biodiversity Importance (score)	2.56	10. Biodiversity importance (score)	

Water Risk Filter

Country Overview - Belize

Indicator	Value	Description	Source
10. Biodiversity Importance (rank)	160	10. Biodiversity importance (rank)	
11. Media Scrutiny (score)	2.55	11. Media Scrutiny (score)	
11. Media Scrutiny (rank)	145	11. Media Scrutiny (rank)	
12. Conflict (score)	1.57	12. Conflict (score)	
12. Conflict (rank)	184	12. Conflict (rank)	
1.0 - Aridity (score)	1.00	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)	178	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)	1.00	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)	190	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)	1.13	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)	140	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)	1.25	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)	152	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)	2.49	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)	41	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)	1.06	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)	186	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)	2.02	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)	190	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)	3.85	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)	60	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.

Indicator	Value	Description	Source
2.2 - Projected Change in Flood Occurrence (by ~2050) (score)	2.00	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)	142	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)	1.89	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)	158	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)	1.13	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)	177	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)	4.33	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)	9	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)	2.20	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)	108	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)	98	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.

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Indicator	Value	Description	Source
5.2 - Freshwater Law Status (SDG 6.5.1) (rank)	103	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)	5.00	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)	16	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)	3.00	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)	151	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)	1.00	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.

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Indicator	Value	Description	Source
6.2 - Freedom in the World Index (rank)	179	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)	3.00	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)	104	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)	4.00	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)	20	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)	5.00	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)	16	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)	2.78	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)	130	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)	1.00	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)	177	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)	3.00	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)	97	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)	5.00	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)	8	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)	1.00	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)	185	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)	1.84	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.

Indicator	Value	Description	Source
10.1 - Freshwater Endemism (rank)	181	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)	3.28	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)	88	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)	171	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)	2.00	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)	145	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 - Belize

Indicator	Value	Description	Source
12.1 - Conflict News Events (RepRisk) (score)	1.00	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)	189	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)	2.13	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)	110	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 (#)	366954	Population, total	The World Bank 2018, Data , hompage accessed 20/04/2018
GDP (current US$)	1741100000	GDP (current US$)	The World Bank 2018, Data , hompage accessed 20/04/2018
EPI 2018 score (0-100)	57.79	Environmental Performance Index	
WGI -Voice and Accountability (0-100)	49.05	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 - Belize

Indicator	Value	Description	Source
WGI -Political stability no violence (0-100)	69.95	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)	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 - Regulatory Quality (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 - Rule of Law (0-100)	18.27	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)	49.52	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 - Belize

Indicator	Value	Description	Source
WRI BWS all industries (0-5)	1.35	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)	101	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)	131	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)	130	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)	129	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 - Belize

Indicator	Value	Description	Source
Baseline Water Stress (BWS) - 2030 BAU (increasing rank describes lower risk)	133	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)	132	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)	129	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)	131	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)	133	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)	130	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 - Belize

Indicator	Value	Description	Source
Total water footprint of national consumption (m3/a/cap)	2010.36	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 (%)	11.46	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)	3.55	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)	3.55	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 (%)	100.00	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)	15.26	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)	6.47	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)	15.26	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13

Water Risk Filter

Country Overview - Belize

Indicator	Value	Description	Source
Total renewable water resources (10^9 m3/year)	21.73	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Dependency ratio (%)	29.79	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)	60479.00	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]	5.96	WorldHappinessReport.org	World Happiness Report, homepage accessed 20/04/2018

Country Aspects

1. PHYSICAL ASPECTS

1.1. WATER RESOURCES

1.1.1. WATER RESOURCES

Belize is very rich in surface and groundwater resources. At present, however, total water resources cannot be evaluated because the existing data are limited, particularly with regard to groundwater availability.

Surface water resources appear to be abundant all over the country except on the Vaca Plateau, where streams disappear in the porous limestone. The northern rivers show meandering streams while the southern have smaller basins and flow more rapidly into the sea. The sum of the quantified river discharges is 15 km3/yr, occupying 59 per cent of the territory. Five of the rivers originate in Mexico and Guatemala. The Rio Hondo forms the northern boundary of the country, with Mexico, and, in the south, the Sarstoon River is the boundary with Guatemala.

The existing aquifers and their annual recharge rate have not been quantified. Generally, groundwater is available throughout the less mountainous areas of Belize and favourable yield characteristics can be attributed to geology and climatic conditions. The northern region consists of calcareous sediments that have shown high permeabilities. In the south, where limestones are found, similar groundwater yield conditions are indicated, while the shales and slates are naturally poorly permeable and therefore have low capacity for groundwater extraction.

Sporadic occurrences of poor quality groundwater occur. High concentrations of chloride are found along the coast and along rivers that are subject to tidal effects. Chloride waters are evident in some inland wells in the northern half of the country, probably as a result of the dissolution of salts within the calcareous sediments. Large concentrations of hardness and sulphate are evident in some areas, particularly the Corozal District. While quality problems do exist, it has been Belize's experience that acceptable quality water can usually be located around the country for central supply systems with sufficient test drilling. Poor-quality groundwater can be expected during the dry season when freshwater recharge from precipitation is negligible, particularly in the north, where it extends for three to four months.

Belize relies on oil imports and Mexican power for the provision of electricity. As a means of import substitution and reducing the average cost of supplying power, proposals have repeatedly been made for hydroelectric development within the country. Belize is well endowed with potential sites for the development of large and small hydroelectric projects, with eight such sites having been identified. A number of small privately owned plants currently exist. A major hydroelectric project called El Mollejón at Vaca Falls at the confluence of the Rio On and the Macal river is currently in operation. This dam generates 25.2MW of electricity for national distribution.

Belize has been uniquely endowed with substantial surface and groundwater resources. A dependable tropical/subtropical rainfall regime in the northwest Caribbean region replenishes the freshwater resource after extended dry periods, which are often induced by recurrent atmospheric/oceanic phenomena such as El Niño Southern Oscillation (ENSO), the North Atlantic Oscillation (NAO), and feedback mechanisms associated with climate change. However, increase in demand for fresh water resulting from increasing population, greater economic activity and agricultural expansion are threatening the quality and availability of fresh water. Coupled with this is the added stress on the resource induced by the increasing climatic variability witnessed during the past decade or two (Frutos, R. 2003).

Belize has a total of 18 major river catchments with another 16 sub-catchments, which drain the Maya Mountains and discharge into the Caribbean Sea. Boles (1999) identifies 16 principal watersheds, which he roughly groups into six main watershed regions based on general characteristics of topography, geology, soils, rainfall and land use. He defines a watershed region as a cluster of watersheds that share many structural, climatic and often impact characteristics. These main watershed regions are the Northern, the Northeastern, the Central, the Southeastern, the Southwestern and the Southern Watershed Regions (Frutos, R. 2003).

The total volume of freshwater available per capita in Belize in 1995 was 8,800m3, the highest in Latin America (CCAD, 1998; Belize First National Communications COP/UNFCCC, 2000). In additions, numerous freshwater and brackish water lakes or lagoons are scattered throughout the central and northern coastal areas and low-lying inland areas (Frutos, R. 2003).

Potable water supply for urban communities and some rural settlements, and the provision of sewerage services for Belize City and Belmopan, are provided by Belize Water Services (BWS), a private water company which bought the assets and liabilities of the former Water and Sewerage Authority of Belize (WASA) in 2000. The company manages water supply systems for nine urban areas and some 56 rudimentary systems. The average daily water supply from river sources is approximately 3.79 million gallons, from groundwater sources it is 0.59 million gallons, and from springs it is 0.38 million gallons (Frutos, R. 2003).

Groundwater is a vital source for freshwater in rural Belize, where almost 95 per cent of the fresh water supply comes from groundwater (Rural Water Unit, Ministry of Rural Development) (Frutos, R. 2003).

Groundwater is extracted in rural areas through the use of hand pumps and rudimentary water systems. The Rural Water Unit is primarily responsible for drilling wells and installing pumps. It also works closely with the community in the development of rudimentary water systems, which are financed jointly by the government of Belize through Social Investment Funds (SIF) and United Nation Agencies such as UNICEF, PAHO and UNHCR (Frutos, R. 2003).

Belize's water resources are vitally important for the economic development of the nation and the welfare of its people. The resource is finite and vulnerable to degradation. As in most places, water is considered a free resource and available for the benefit of all (Belize First National Comm. to the COP/UNFCCC, 2000). People use it with little consideration of the needs of others or of its sustainability. Water resources in shared watersheds are the property of co-basin countries; however, little consideration has been given to the proportional ownership and level of responsibility for its protection. Groundwater abstraction is unregulated, as is the case with surface water, and the unrestricted use of fresh water for the cultivation of banana, rice and citrus keeps increasing (Frutos, R. 2003).

1.1.2. WATER USE

Water is mainly used in industrial processes. The total water withdrawal of 95 million m3/year is negligible compared to surface water resources. Domestic water consumption per capita is about 240 to 280L per day in urban areas and about 160L per day in rural areas. This is about equal to the amount consumed in industrialized countries.

Of the total water used in urban areas, 70 per cent is surface water. Groundwater is also used as a source of drinking water in the cities of the Corozal, Orange Walk, Cayo and Toledo Districts and in some rural areas of Toledo and Cayo. Data on water sources used by industry are not available. However, it is assumed that surface water is also its main water source. The amount of water used for irrigation is estimated to be less than one per cent of total water withdrawal.

Water quality in urban areas is good and is constantly monitored by the Water and Sewerage Authority (WASA). In rural areas, however, the water quality, mainly in the districts of Toledo, Stann Creek and Cayo, is not satisfactory: full water purification takes place only in the systems that are connected to urban WASA systems (about 30 per cent).

A rough estimate made in 1994 indicated that approximately 39 per cent of the population was served with adequate sanitation facilities.

Belize used around 579 million m3 (15.3 billion gallons) of water in 2007. The demand for fresh water resources in Belize emanates from three broad economic sub-sectors: agricultural, industrial and domestic/residential. In 2005 , agricultural, industrial and domestic/residential users required 43.7 per cent, 36.5 per cent and 19.7 per cent respectively of the total demand. Belize's use is consistent with that of other countries in the region that show a greater economical demand for water by the agricultural and industrial sectors (BEST, 2009).

Belize has 39 identifiable watersheds, of which 18 are classified as major watersheds. Swamps cover 13.4 per cent of mainland Belize, and 29 lagoons (inland water bodies) have been identified. Wetlands and lagoons form the coastal transition/buffer zones between the fresh water supplied by the watersheds and the marine environment. The transition zones provide an environment for abundant mangrove stands, which filter the runoff before it enters the marine ecosystems. The mangrove ecosystem provides excellent habitat for fish nurseries. In addition, the filtering function of the ecosystem reduces the volume of sediments that eventually reaches the barrier reef.

Changes in fresh water inflows into the sea will lead to changes in the physical (turbidity), chemical (salinity, nutrient loads) and biological (flora and fauna) characteristics of water – all of which affect estuarine and coastal ecosystems and may threaten extinction or migration of species to better habitats (BEST, 2009).

The coastal and marine ecosystems are very important to Belize's economy. The Belize Barrier Reef is one of the main attractions for tourists visiting Belize. It accounts for 22 per cent of visits. It is estimated that, in a year, 13,981 Belizeans are employed in the tourism industry. The marine fishing industry provides employment for more that 6,000 fisherfolk. In 2006, tourism contributed 16.8 per cent and the fishing industry 3.1 per cent of Belize's GDP, respectively (BEST, 2009).

1 <small>Abstract of Statistics, Central Statistical Office of Belize, 2005</small> 2 <small>www.belizetourism.org/belizetourism/tourism-revenues.html</small> 3 <small>Abstract of Statistics, Central Statistical Office of Belize, 2005</small> 4 <small>www.belizetourism.org/belizetourism/tourism-revenues.html</small>

In agriculture, the government of Belize (GOB) actively promotes the effective and efficient use of water through improved irrigation systems and accessibility to reliable water sources among its farming communities. Through a United Nations Food and Agriculture Organization project, an Irrigation/Drainage Unit at Central Farm has been established with the aim of improving irrigation and drainage systems among the farming communities across the country. In the area of water quality and the integrity of water sources, GOB, through the Pesticide Control Board, a quasi-governmental agency, monitors, regulates and evaluates the use and application of agro-chemicals to reduce the threat of contamination of surface and groundwater resources. The on-going Persistent Organic Pesticide Project should result in the adoption of policies and legislation to further control and discard lethal chemicals that could directly or indirectly contaminate the country's water resources (BAS, 2008).

Land use practices are intricately connected to the quality, quantity and viability of the country's water resources. Legislation protects a 66-foot riparian buffer zone along all water bodies, but this law is not enforced. Moreover, the 66-foot zone is not adequate in sensitive areas, such as steep hillsides, swamp/marsh lands, and mangrove areas. Although there is now adequate cover, the forested areas, especially mangrove forests, continue to diminish at an alarming rate. The main driving forces in this respect include land clearing, illegal logging and illegal encroachment in reserves, coastal development, and bush fires. Improper agricultural activities can also result in loss of surface soils and chemical pollution of water resources (BAS, 2008).

Water surplus is also problematic during the rainy season, resulting in widespread floods in many parts of Belize. Land use and land cover changes affect the frequency and magnitude of floods and sediment loads. Stream response to such changes may be manifested as changes in sedimentation and erosion rates, meandering variability, or changes in the dimensions of channels. Complete removal of land cover will result in higher runoff and an increase in the frequency and magnitude of flood events. In areas where the natural vegetation is permanently converted to agriculture, substantial long-term changes in flooding and sedimentation occur (BAS, 2008).

1.2. WATER QUALITY, ECOSYSTEMS AND HUMAN HEALTH

Population pressure is negligible and tourism is becoming an important source of income in

Belize. Belize, in general, has plenty of water resources of good quality. Yet conflicts over contamination are beginning between unrestricted industrial waste disposal and drinking water supply.

Irrigation in Belize has been marginal because of the country's climatic and social conditions. Irrigation and drainage information is non-existent. Public irrigation and drainage systems are non-existent; a few private irrigation systems were developed in the 1990s, leading to surface and sprinkler irrigation being used for citrus and banana production, surface irrigation for rice and micro-irrigation for papaya production. It is expected that in the coming years more banana plantations will be irrigated, so that the estimated water withdrawal may be of the order of 240,000m3/year.

Around 59 per cent of the urban population has access to a sanitation system. During the past decade the government embarked on an ambitious programme to increase the provision of safe drinking water, focusing primarily in rural areas, where coverage increased from 51 per cent in the early 1990s to 92 per cent in 2003 (BAS, 2008).

Nationwide, coverage of safe drinking water provision stands at 92 per cent for rural areas and 99.6 per cent in the urban centres (Ministry of Health/PAHO, 2003). Adequate sanitation service (sewer/septic tank) has lagged behind, and stood at 55 per cent coverage countrywide in 2001. In that year, adequate sanitation coverage was 68.1 per cent for urban areas and 25.8 per cent in rural communities (MDGs First Report, 2005). The challenge for Belize is to ensure improved sanitation coverage, particularly in rural areas (BAS, 2008).

Belize needs to improve its water quality and sanitation systems. Although there is limited evaluation and monitoring systems, it is estimated that a large part of the surface water in urban areas is contaminated because of the inadequate disposal of household, agricultural and industrial liquid and solid wastes (BAS, 2008).

For human consumption, a radius of 30m (100ft) is required for proper protection of a water source. The area should be properly marked, fenced and maintained. An outer perimeter of 300m (1,000ft) in radius is required to serve as a buffer zone.

Even though the situation is not critical at present, if no changes are made, Belize will face a crisis in water governance. Belize could have serious problems of shortage and pollution with regard to its surface and underground water supplies. The Belizean perspective on water has to change from one of reactive concern for this vitally important and abundant resource to one of proactive action to safeguard Belize's watersheds and vital resources. Much has been done, but much more needs to be done to ensure the sustainable use and management of Belize's water resources for the benefit of all Belizeans (BAS, 2008).

2. GOVERNANCE ASPECTS

2.1. WATER INSTITUTIONS

There is no single authority with responsibility for water resources in Belize. The various government agencies involved are:

•Ministry of Natural Resources:

-the Water and Sewerage Authority (WASA) is responsible for maintaining and developing waterworks, increasing and improving the water supply and promoting the conservation and proper use of water resources in the country;

-the Rural Water Supply and Sanitation Department is responsible for providing drinking water and sanitation in the rural areas, supervised by WASA;

-the Land Utilization Authority is responsible for the effects of land use on water and natural resources.

•Ministry of Works: implements infrastructure projects such as drainage, bridges, fluvial transport and maintenance of canals;

•Ministry of Energy and Communications:

-the National Meteorology Service is responsible for the monitoring of climatic and hydrologic conditions;

-the General Directorate of Electricity Supply provides licences for and supervision of hydroelectric power.

The legal framework for water resources, as shown above, is dispersed and segmented. Certain aspects are taken into consideration twice and others not at all. Issues such as groundwater use and management are not the specific responsibility of any institution; irrigation is not considered in the government programme.

2.2. WATER MANAGEMENT

The major obstacle for the development and protection of water resources in Belize is the lack of a unique authority with responsibility for water resources. Joint efforts are being made to create a National Water Commission, but these have not yet been successful.

Integrated Water Resources Management (IWRM) is one approach to promoting sustainable water resources use and management. This is the paradigm promulgated by GWP and is essentially a stakeholder/community-based, holistic approach for the management of a country's water resources.

The GWP defines IWRM as a process that promotes the coordinated development and administration of water, land and related resources, in order to maximize the social and economic benefit in an equitable way, without jeopardizing the sustainability of vital ecosystems (TAC, Background Paper, No. 4/GWP; p.22). As a member of the Central American Integration System (SICA) and CARICCOM, Belize participates actively in regional efforts to coordinate the management of the region's water resources. Some of these initiatives include:

•the Vision on Water, Life and the Environment for the 21st Century, conducted in 2000 by the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC);

•workshops and seminars on groundwater-related issues and water legislation conducted by the Central American Technical Advisory Committee (CATAC) of the GWP;

•the Commission for Hydrology of the World Meteorological Organizations' regional and international workshops and conferences;

•the recent Water Quality Standard Project for Belize conducted by PAHO, the Red Cross and the Belize Public Health Bureau;
•CEDERA initiatives on disaster management and flood mitigation (Frutos, R. 2003).
The 'vision' for sustainable water resources management in Belize will need to address many problems and misguided practices. It will need to consider an integrated approach to water resources management, which requires the participation of all stakeholders, communities and decision-makers. The pro tem Water Commission must undertake proactive actions and strategies to change the public's attitude toward sustainable water use and conservation, and submit binding and effective policy recommendations to the government of Belize, which should help formulate legislation for regulating the use of Belize's freshwater and safeguard this vital resource for present and future generations of Belizean (Frutos, R. 2003).
Acording to BAS (2008), an assessment conducted by the pro tem Water Commission (NPTWC) in 2006 indicated that the current system of water resources management is incoherent and fragmented and does not provide for the planned allocation, sustainable development and adequate protection of Belize's water resources. Conflicts in allocation and protection, along with confusion regarding ownership and proper use of the resource, have become frequent and will accelerate as Belize's population increases and the productive sector expands. Belize has better water availability than other countries in Central America, but is not very different to these other countries in matters of water management and legislation covering water supply and sanitation. This is due to the fragmented administration of the water sector (BAS, 2008).
Belize does not have any supervisory institution, and has not ratified a water policy or passed new water laws. There is a need for an institutional framework, the definition of its finances, and the inclusion of economic instruments. Belize needs to adopt IWRM in the whole country and in transboundary basins. Legislation relating to water resources management and protection in Belize is fragmented and often not effectively implemented. The government needs to consider water as a resource in its own right and manage it accordingly.
The first step is to implement IWRM through a participative process, towards effective water governance. IWRM is long overdue, especially considering the current and future free market economy, the increasing demands for freshwater as the population increases, the unregulated abstraction of surface and groundwater, extreme hydro-meteorological events, and the increasing threats to Belize's water resources posed by untreated wastewater and other contaminants entering both surface and groundwater bodies. Shortage of fresh water becomes a problem during times of recurrent drought, particularly in northern and central Belize (BAS, 2008).

2.3. WATER POLICY AND LEGAL FRAMEWORK

There have been previous attempts to draft water policy, including the first major effort, by Harrison in 1994. This attempt was followed by a review and consultations carried out by Cardona in 2005 which described the process of policy formulation, outlined thematic areas and made proposals for changes to Harrison's draft proposals. The Hydromet section of the National Meteorological Service on behalf of the pro tem Water Commission also conducted three national consultations nationwide during 2006-2007. That effort did not yield a policy document but, rather, recommended changes to the proposals by Harrison (BEST, 2008).
Previous draft policies, this proposed new set of policies, and global climate change projections all support the view that all water resources are being subjected to increasing pressures and significant variations. Belize is no exception. These forecast variations are based on climatic event modelling and initial empirical data and are spelt out in projections of vulnerability that will be due to global climate change (BEST, 2008).
Water can become scarce, especially in localized areas. Scarcity of this resource will lead to conflict. The nature of conflict will have to be understood and appropriate conflict resolution mechanisms put into place. Communication with stakeholders is required from the outset for those sub-sectors of the economy that are directly affected, such as food producers and processors and manufacturers, and the Belizean people and their visitors. Belize is a young nation and suffers from limited institutional capacity and limited governance, financial and administrative resources (BEST, 2009).
According to BEST (2009), the body of policies, legislation and institutions of Belize are in varying stages of development. An integrated water policy is in draft form and portions of the required legislation have been enacted. Although there are various water management institutions in existence, the country lacks the complete range of integrated responses required for adaptation to climate change.
Belize has various pieces of legislation pertaining to water. These laws can be classified into the following four areas of focus (BAS, 2008):
•supply of water and sewerage services;
•water safety for human consumption and health;
•protection and conservation of water sources;
•water abstraction.
The Environmental Protection Act (CAP. 328) pertains to the protection of the environment (water, air, land, flora, fauna and humans) in general. The administration of this Act is the responsibility of the Department of the Environment.
Section 10 of the Act contains a general statement of the duty of persons exploiting the natural resources of Belize, which rules that such persons exploiting natural resources, including water resources and the seas, shall ensure the protection of the environment against unnecessary damage or from pollution by harmful substances. The Act contains provisions specifically relating to the protection of water resources. Section 11, for instance, prohibits the discharge of waste that might directly or indirectly pollute water resources or damage or destroy marine life, while Part IV prohibits dumping at sea, which includes the territorial seas and internal waters of Belize (BAS, 2008).
The Act and the Environmental Impact Assessment Regulations also require that an Environmental Impact Assessment (EIA) be conducted for projects which may significantly affect the environment. An EIA is mandatory for certain activities with the potential to have negative effects on water resources (BAS, 2008).

Finally, the legislation establishing the National Emergency Management Organization (NEMO) recognizes the need to safeguard the availability of safe and sufficient drinking water during times of emergency. Under such conditions, priority is given to water for human consumption. NEMO, the Belize Red Cross and other humanitarian agencies coordinate their responses to the needs of the most affected. Meanwhile, the Ministry of Health, in partnership with PAHO/WHO, has made great strides in containing the ravages of waterborne diseases, especially during the aftermath of recent hurricanes that have affected Belize (BAS, 2008).

3. GEOPOLITICAL ASPECTS

Belize is located in Central America, bordering the Caribbean Sea, between Guatemala and Mexico. North to south, Belize is 274km long and, east to west, 109km wide.

There is an urgent need to strengthen synergistic initiatives at the local level among the three Rio Conventions and other multilateral environmental agreements (MEAs). This was affirmed at the recently concluded Conference of the Parties to the United Nations Convention to Combat Desertification and Drought (BAS, 2008).

Recognizing Belize's commitment to the MEAs and MDGs and cognizant of the dis-articulation and disjointed nature of Belize's legislations as they pertain to water and the management of water resources, the GOB has seen the need to draft an Integrated Water Resources Management (IWRM) policy and legislation in order that the country can meet its present and future socio-economic development in a sustainable and equitable manner (BAS, 2008).

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