Water Risk Filter

Country Overview - Swaziland

Water Indicators

Indicator	Value	Description	Source
Overall Basin Risk (score)	2.92	Overall Basin Risk (score)	
Overall Basin Risk (rank)	41	Overall Basin Risk (rank)	
Physical risk (score)	3.18	Physical risk (score)	
Physical risk (rank)	30	Physical risk (rank)	
Regulatory risk (score)	2.91	Regulatory risk (score)	
Regulatory risk (rank)	82	Regulatory risk (rank)	
Reputation risk (score)	2.17	Reputation risk (score)	
Reputation risk (rank)	171	Reputation risk (rank)	
1. Quantity - Scarcity (score)	2.55	1. Quantity - Scarcity (score)	
1. Quantity - Scarcity (rank)	65	1. Quantity - Scarcity (rank)	
2. Quantity - Flooding (score)	3.85	2. Quantity - Flooding (score)	
2. Quantity - Flooding (rank)	49	2. Quantity - Flooding (rank)	
3. Quality (score)	3.64	3. Quality (score)	
3. Quality (rank)	46	3. Quality (rank)	
4. Ecosystem Service Status (score)	3.86	4. Ecosystem Service Status (score)	
4. Ecosystem Service Status (rank)	3	4. Ecosystem Service Status (rank)	
5. Enabling Environment (Policy & Laws) (score)	2.15	5. Enabling Environment (Policy & Laws) (score)	
5. Enabling Environment (Policy & Laws) (rank)	122	5. Enabling Environment (Policy & Laws) (rank)	
6. Institutions and Governance (score)	3.50	6. Institutions and Governance (score)	
6. Institutions and Governance (rank)	52	6. Institutions and Governance (rank)	
7. Management Instruments (score)	2.18	7. Management Instruments (score)	
7. Management Instruments (rank)	139	7. Management Instruments (rank)	
8 - Infrastructure & Finance (score)	4.45	8 - Infrastructure & Finance (score)	
8 - Infrastructure & Finance (rank)	22	8 - Infrastructure & Finance (rank)	
9. Cultural Diversity (score)	1.00	9. Cultural importance (score)	
9. Cultural Diversity (rank)	136	9. Cultural importance (rank)	
10. Biodiversity Importance (score)	3.06	10. Biodiversity importance (score)	

Indicator	Value	Description	Source
10. Biodiversity Importance (rank)	119	10. Biodiversity importance (rank)	
11. Media Scrutiny (score)	2.55	11. Media Scrutiny (score)	
11. Media Scrutiny (rank)	98	11. Media Scrutiny (rank)	
12. Conflict (score)	1.91	12. Conflict (score)	
12. Conflict (rank)	165	12. Conflict (rank)	
1.0 - Aridity (score)	2.45	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)	51	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)	165	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)	1.84	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.

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Indicator	Value	Description	Source
1.2 - Baseline Water Stress (rank)	98	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)	2.97	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)	86	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)	1.64	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)	125	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)	4.54	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)	20	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)	3.00	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) . 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)	81	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)	3.95	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)	50	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)	127	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)	3.64	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)	46	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)	4.14	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)	7	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)	3.12	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)	41	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)	3.73	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)	43	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)	4.00	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)	14	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)	1.00	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)	147	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)	2.00	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)	134	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)	40	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)	5.00	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)	17	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)	145	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)	2.00	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)	126	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)	51	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)	2.21	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)	162	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)	4.00	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)	23	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)	16	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)	4.00	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)	22	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)	136	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)	2.11	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.

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Indicator	Value	Description	Source
10.1 - Freshwater Endemism (rank)	169	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)	4.00	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)	53	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)	82	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)	90	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)

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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)	160	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)	2.83	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)	58	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 (#)	1343098	Population, total	The World Bank 2018, Data , hompage accessed 20/04/2018
GDP (current US$)	3720649375	GDP (current US$)	The World Bank 2018, Data , hompage accessed 20/04/2018
EPI 2018 score (0-100)	40.32	Environmental Performance Index	
WGI -Voice and Accountability (0-100)	29.52	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

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Indicator	Value	Description	Source
WGI -Political stability no violence (0-100)	9.36	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)	33.65	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)	29.33	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)	40.87	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)	39.42	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

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Indicator	Value	Description	Source
WRI BWS all industries (0-5)	3.11	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)	62	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)	65	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)	66	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)	64	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 - Swaziland

Indicator	Value	Description	Source
Baseline Water Stress (BWS) - 2030 BAU (increasing rank describes lower risk)	65	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)	65	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)	63	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)	67	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)	66	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)	65	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.

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Indicator	Value	Description	Source
Total water footprint of national consumption (m3/a/cap)	1397.52	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 (%)	59.28	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)	49.85	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)	49.85	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 (%)	89.95	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)	2.64	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)	1.87	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)	2.64	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

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Indicator	Value	Description	Source
Total renewable water resources (10^9 m3/year)	4.51	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Dependency ratio (%)	41.46	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)	3504.00	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]	0.00	WorldHappinessReport.org	World Happiness Report, homepage accessed 20/04/2018

Country Aspects

1. PHYSICAL ASPECTS

1.1. WATER RESOURCES

1.1.1. WATER RESOURCES

The four main river systems in Swaziland are:
-The Komati and Lomati systems, in the north of the country. Both originate in South Africa and flow out of Swaziland back into South Africa, before entering Mozambique;
-The Mbuluzi River rises in Swaziland and flows into Mozambique;
-The Usuthu River, together with a number of major tributaries, originates in South Africa and flows out into Mozambique, forming the border between Mozambique and South Africa;
-The Ngwavuma, in the south of the country, rises in Swaziland and flows into South Africa before entering Mozambique.
The fifth river system contributing to the surface water resources of Swaziland is the Pongola River, which is found in South Africa, south of Swaziland. The Jozini Dam, built on the South African side, floods some land on the Swaziland side and the water is available for use in Swaziland.
The total renewable water resources of the country are 4.51km3/yr, with 1.87km3/yr or 42 per cent originating from South Africa. A quantitative assessment of groundwater resources of the country has not been undertaken. It is estimated that the groundwater resource potential is about 21m3/s countrywide, which is equal to 0.66km3/yr. The bulk of groundwater resources occur in the Highveld and Middleveld regions. With the exception of the post-Karoo igneous intrusive formation and the recent thin alluvia along the major river valleys, the strongly consolidated rocks of the Archean Basement Complex and the Karoo system underlie practically all of Swaziland and limit the groundwater development potential of the country.
There are nine major dams with a height of more than 10m and with a total storage capacity of about 585 million m3. Seven are used for irrigation, one for hydroelectric purposes and one for water supply.
The average rainfall in Swaziland is about 788mm/yr, ranging from as low as 500mm in the dry Lowveld region to 1,500mm in the wet and cooler Highveld region. The high natural variability of rainfall and river flows means that water availability is low and has to be enhanced through the construction of large dams and other water harvesting measures. Because the cost of these interventions is high, Swaziland has not developed her river basins to their full usage potential; hence water scarcity remains a serious challenge. Recurrent droughts have also exacerbated the problem (NWP, 2009).
There is a level of uncertainty regarding available water resources. One source put it at 2,836m³/per capita per annum in 1998. Other estimates place it at 4,500m³/capita/annum. An estimate attributed to a study by the United States of America Army Corps of Engineers in 1981 estimated that full development of dams in South Africa had the potential to reduce flows in Swaziland from 4.5km³/yr to 3.9 km³/yr. This decrease in flow, coupled with population growth of about 2.9 per cent per year would imply a significant drop in per capita water flows (NWP, 2009).
Sustainable groundwater resources are estimated at about 20,000L per second and only about 6 per cent of this is perceived to have been exploited. The water resource estimates given above require validation through detailed studies taking into account the emerging impacts of global warming (NWP, 2009).

1.1.2. WATER USE

Total water withdrawal for agricultural, municipal and industrial purposes is estimated at just over 1km3. Over 95 per cent of the water resources in the country are used for irrigation.
In Swaziland, water is used in various sectors such as domestic supply, industry, forestry, hydro-power and irrigation. Growing population and increased economic development has led to higher water use and increased competition among water users for scarce resources. The development of water resources by neighbouring states also necessarily results in the decrease of water available for use in the country (NWP, 2009).
Agriculture presently makes the largest contribution to the Swaziland economy, largely through irrigated plantations. Irrigation uses about 96 per cent of the country’s surface water resources, mostly for growing sugarcane. There is no longer any scope for increased irrigation development without the construction of new dams or the large-scale application of water demand management measures in the irrigation sector. With the growing industrial sector and rising interest in tourism and recreational activities involving water bodies, the pressure on water resources is increased. The need for policy guidance and coordination in water resources management becomes ever more apparent (NWP, 2009).
Water supply and sanitation standards, like those of water supply, deteriorate as one moves from urban areas to peri-urban and finally to rural areas. The 2006 Poverty Reduction Strategy and Action Plan assert that only 45 per cent of people in rural areas have proper sanitation facilities. In urban areas, 63 per cent of households use flush-toilets and the rest either use pit latrines or the bush. It is the intention of the Swaziland government that all people have access to a minimum of 30L of safe and clean water per capita per day at a distance of no more than 200m. The Department of Water Affairs is striving to increase the number of water sources. However, a significant number of water supply systems are not serviced due to management, maintenance, affordability and water quality problems (NWP, 2009).

1.2. WATER QUALITY, ECOSYSTEMS AND HUMAN HEALTH

Sanitation coverage is poor in Swaziland, as an estimated 59 per cent of the rural population have pit latrines and only 33 per cent have access to a clean water supply. The high rate of infant mortality in the country is attributed to diarrhoea, malnutrition and infectious diseases, which can be linked to the lack of a potable water supply and sanitary facilities and to poor hygiene.

The highest risk of bilharzia infection is in the Middleveld and Lubombo plateau where rivers flow slowly and stagnant pools form. The high temperatures and the lack of alternative water supply sources mean that people use the rivers and streams for swimming, washing and drinking. Domestic animals use the same water and contaminate it, increasing the risk of transmitting infections to humans. No study to establish the full extent of the problem of bilharzia has been undertaken. However, it was estimated in 1990 that the infected population may be as high as 20 per cent of the population of the Middleveld and the Lubombo plateau.

Malaria remains a major health problem in the country. The disease is seasonal and unstable, occurring mainly during or after the rainy season. Malaria is prevalent in the Lowveld, Lubombo Plateau and some parts of the Middleveld. It is estimated that 30 per cent of the population resides in malaria risk areas, 38 per cent in malaria receptive areas and 32 per cent in non-malaria areas.

Over the last few decades, Swaziland has suffered an almost endless cycle of natural disasters, including droughts, floods, disease epidemics, storms and wildfires. Yet, despite the frequency with which such events occur, the response to disasters is often slow and ineffective (UNEP, 2010).

Many of the most devastating disasters recorded over the last century occurred in the decades since 1980. The 10 most significant events affected a combined total population of over 2.5 million people (UNEP, 2010).

Swaziland has been particularly vulnerable to droughts: the nation experienced drought periods in 1981, 1982, 1991 to 1996, and 2001 to 2007 affecting an estimated 410,000 people – over a third of the population. The droughts devastated all four regions in Swaziland, damaging up to 80 per cent of crops in certain areas and severely affecting food security. Aid agencies estimated that up to 50 per cent of the population were left in need of food assistance in the wake of the disasters (UNEP, 2010).

A changing climate will have serious implications on the frequency of such hydro-meteorological hazards in the country. When the risks are combined with high levels of poverty and limited infrastructure and safety nets, the ramifications can be devastating for vulnerable populations and ecosystems (UNEP, 2010).

Following one of the longest drought periods in decades, water rationing was introduced as a coping mechanism in late 2007. The Swaziland Water Services Corporation, the state-run water utility, introduced water rationing following declines in water levels nationwide – beyond those in the typically dry regions of the south and east (UNEP, 2010).

Cuts were introduced in the capital, Mbabane, the commercial centre of Manzini, the Matasapha Industrial Estate and Ezulwini, a key tourist location, leading to further economic ramifications for Swaziland (UNEP, 2010).

With access to potable water already limited and 40 per cent of the population using unimproved water sources in 2006, severe shortages drove many families to drinking water from streams and rivers, sharing with livestock and increasing their vulnerability to waterborne diseases (UNEP, 2010).

As Swaziland becomes more vulnerable to extended and widespread drought periods, water shortages and water rationing could become a frequent occurrence (UNEP, 2010).

2. GOVERNANCE ASPECTS

2.1. WATER INSTITUTIONS

The Ministry of Natural Resources and Energy (MNRE) is responsible for assessment, monitoring, management and allocation of water resources in the country. It has several branches responsible for specific activities. The Water Resource Branch is responsible for stream flow observation, planning of water resources and control of pollution, while the Rural Water Supply Branch is responsible for water supply and sanitation in rural areas. The Groundwater Unit of the Geological Surveys and Mines Branch is responsible for drilling boreholes and monitoring the withdrawal of underground water. The Swaziland Water Service Corporation, a parastatal organization, is responsible for urban and peri-urban water supply and sanitation. The Swaziland Environment Authority is responsible for pollution control and allocation of compliance certificates after proponents of development projects have submitted environmental impact assessment reports and comprehensive mitigation plans. The Ministry of Agriculture and Cooperatives constructs small earth dams and assists farmers with the use of water resources.

2.2. WATER MANAGEMENT

According to the Food and Agriculture Organization on the United Nations (FAO) (2005), the existing policy framework in the country is fundamentally flawed and not conducive to the good management of water resources.

The Swaziland National Water Policy (NWP) sets out the vision, intention and strategy of the Kingdom of Swaziland on the development and management of water resources. The NWP is based on the concept enshrined in the National Development Strategy (NDS), whereby the goal is poverty eradication and economic prosperity. The water sector as expressed in the NDS is about the development and implementation of strategies for poverty alleviation and drought mitigation, with the main objective of improving water availability for both socio-economic and economic productivity. Therefore, water is construed as an engine for development which ensures sustainable economic prosperity and is consequently expected to play a catalytic role in poverty eradication in the country through various interventions. This is in line with the vision of the water sector, which is: national economic prosperity and social uplifting through equitable, productive and optimum use of water resources while ensuring environmental sustainability (NWP, 2009).

To achieve this goal, water has to play its role in the attainment of the following objectives: social equity; food security; peace and stability; energy security; safety from water-related disasters; environmental sustainability; improved tourism and recreational activities; and industrial development (NWP, 2009).

It is very clear that a multi-sectoral approach is required to achieve the above objectives; hence an Integrated Water Resources Management (IWRM) approach is adopted in this policy through the development of an IWRM Strategy. This strategy is envisaged to provide a framework to guide key players in the water sector in Swaziland through the use of the following tools addressing key focal areas (NWP, 2009):

-Institutional arrangements;
-Water resources development;
-Water resources management;
-Water resources information management;
-Water supply and sanitation service provision;
-Legal regulatory instruments of good practice;
-Capacity building, research and training;
-Awareness creation and stakeholder participation.

All these interventions need to have IWRM Plans which give details of the intervention, timeframes and budgets (NWP, 2009).

2.3. WATER POLICY AND LEGAL FRAMEWORK

According to the FAO (2005), Swaziland does not have a clear policy on water use and management. The overall management of water resources is on an ad hoc basis through several uncoordinated pieces of legislation, spread among a number of ministries as well as other institutions outside the government, that aim to solve specific issues without due consideration of harmonization. Such Acts include the Protection of Freshwater Fish Act of 1938, the Swaziland Electricity Act of 1963, the Water Act of 1967, the Water Services Act of 1992, the Komati River Basin Water Resources Development and Utilization Act of 1992, the Joint Water Commission Act of 1992, the Swaziland Environmental Authority Act of 1992, the Swaziland Administrative Order of 1998 and the Borehole Act of the Geological Surveys and Mines, to name a few.

At present, landowners with title deeds on riparian lands are entitled, by virtue of the deed, to abstract underground water as well as water from the stream flowing alongside or within their properties. The Water Act of 1967 (Swaziland government, 1967) is the main legislation that regulates the apportioning and use of water but it only applies to title deed land and thus excludes all communal land, which constitutes 54 per cent of total land in Swaziland.

The Swaziland Environmental Authority Act (Swaziland government, 1992) addresses the issues of water for the environment and pollution control. The Act includes provisions for the establishment of standards and guidelines related to the pollution of air, water and land, as well as for the control of all forms of environmental pollution including that caused by the discharge of toxic wastes into the air, water and land.

The Swaziland Administration Order of 1998 empowers the Ngwenyama (King in Council) to issue orders to be followed in Swazi Nation Land and can be used as a tool for managing water resources on communal land. Among other things, these orders require:

-The prevention of any pollution of the water in, or injury to, any dam, stream, watercourse, waterhole, well, borehole or other water supplies and to prevent the obstruction of any stream or watercourse for the construction, improvement or maintenance of communal water supplies;
-Measures to be taken to secure proper housing and sanitation;
-Regulation of the provision, maintenance and use of communal water supplies.

The National Development Strategy (NDS) intends to formulate a vision and mission statement with appropriate strategies for socio-economic development for the next 25 years and to provide a guide for the formulation of development plans and for the equitable allocation of resources. It is designed to strengthen the government's development planning and management capacities and to have a national consensus on the direction of future developments in the country. The NDS addresses the issue of water resources development and gives several recommendations (National Development Strategy, 1999). It advocates for the development of an overall policy to cover all water uses; the expansion of smallholder irrigation within a national irrigation development plan while encouraging farmers to use all available water catchments; and planning and constructing small- to medium-size dams to provide a reliable source of water for small-scale irrigation, livestock, fisheries and municipal use.

In an attempt to improve the policy framework, the MNRE tabled the Water Bill of 2001 in parliament, to replace the Water Act of 1967 as well as to consolidate the pieces of legislation found in different Acts and Orders. The bill was approved by parliament in 2002, and received the King's assent in April 2003. The new Water Act seeks to streamline the water allocation process, and to increase the role played by water users in the use and management of water resources. It also calls for the establishment of a National Water Authority (NWA), River Basin Authorities and Water Use Associations, which will help in enhancing public involvement in water resources management. It also includes the private sector as a partner in water development. A draft irrigation policy is at present under preparation, with the assistance of the FAO.

The National Water Policy (NWP) development process started in 2000 with financial support from United Nation Development Programme (UNDP). As there was no reference water policy in place, UNDP funded a consultant to educate the water sector on how the policy formulation process is to be conducted (NWP, 2009).

A drafting team consisting of key sector players was convened and a draft produced. This draft was taken through an intensive stakeholder consultation process both within and outside government. However, at around the same time the Southern African Development Community region was also initiating processes for the formulation of a Regional Water Policy and Strategy and this was done with the sole aim of harmonizing all existing policy documents within the sector. This then meant that the NWP formulation process had to be temporarily suspended until the Regional Water Policy was produced. In 2006 the Regional Water Policy and Strategy document was approved and the NWA resuscitated the process to finalize the NWP document (NWP, 2009).

In 2007, the NWA created a multi-stakeholder working group to guide the water policy finalization process. This group, with financial support from the Swaziland Water Partnership, engaged a small team of local experts who did a literature review to enhance the draft produced in 2000. The resultant draft received approval from the NWA and thereafter was taken through the different chiefdoms to gather further inputs. A national stakeholder workshop was then convened before the document was taken to cabinet through the Portfolio Committee for the MNRE (NWP, 2009).

The government of Swaziland has made water resources a high priority in terms of its goals for social and economic development. It is therefore of paramount importance for all interventions that are made in the water sector to be based on sound policy and good implementation strategies which reflect the government's commitment (NWP, 2009).

Before 1967 there was no comprehensive legislation governing water in the country. Instruments such as the Swaziland Administration Act of 1950 had direct or indirect implications for water resource management. The government had almost exclusive responsibility for water in the country. However, back then the resource was not considered as finite and limited; hence this posed no problem. The Water Act of 1967 formalized the sector and in that Act powers to manage and allocate water were vested in a Water Apportionment Board (WAB). The minister responsible for water could hear appeals against the decisions of the board. He/she had power to overrule the decision of the WAB. The Water Act (1967) did not deal with the fragmentation of water among different ministries and departments. It also did not extend the participation wide enough and most of the authority still rested in government (NWP, 2009).

A new Water Act was enacted into law in 2003 and is still in force. This Act seeks to consolidate the administration of water under one ministry. It also created basin level structures (River Basin Authorities, Irrigation Districts and Water User Associations) with significant powers to manage the resource. Above these structures is a National Water Authority, whose role is to supervise the activities of the structures described above and to advise the minister on policy matters (NWP, 2009).

A significant development in the country that positively impacted on the water sector was the enactment of the Constitution of the Kingdom of Swaziland in 2005. The constitution also stipulated provisions related to water. Section 210 of the constitution declares water as a national resource and vests the ultimate responsibility for its protection in the state. Section 215 rules out any private right of property in any water found in Swaziland. Other sections deal with environmental protection which has implications for water as well as parliament's intervention with regards to enactment of laws related to water (NWP, 2009).

3. GEOPOLITICAL ASPECTS

To facilitate the development of water resources of common interest, in 1992 the governments of Swaziland and South Africa signed a treaty for the establishment and functioning of the Joint Water Commission. In addition to any other functions or powers conferred on the commission, it advises the two countries on all technical matters relating to the following:

-The criteria to be adopted in the allocation of the utilizable portion of water resources of common interest between the two countries;

-The investigations for the development of water resources of common interest by the two countries, including the construction, operation and maintenance of any water works;

-The prevention of and exercise of control over, the pollution of water resources of common interest.

Another international body is the Komati Basin Water Authority, which is a bilateral company formed in 1993 under the 1992 Treaty on the Development and Utilization of the Water Resources of the Komati River Basin. Its purpose is to implement phase one of the Komati River Basin Development Project comprising the design, construction and maintenance of Driekoppes Dam in South Africa and the Maguga Dam in Swaziland. The treaty recognizes the rights of Mozambique to a reasonable and equitable share of the water resources of shared rivers.

A Tripartite Technical Committee, established under the Tripartite Agreements between Swaziland, South Africa and Mozambique, is responsible inter alia for identifying and prioritizing capacity-building challenges and opportunities in the water sectors of the three countries, and establishing regime allocations.

The member states of the Southern African Development Community (SADC) have signed a protocol on shared watercourses (Protocol on Shared Watercourses in SADC, 2000). The overall objectives of the protocol are to foster closer cooperation for judicious, sustainable and coordinated management, protection and utilization of shared watercourses and to advance the SADC agenda of regional integration and poverty alleviation. To achieve this objective, the protocol seeks to:

-Promote and facilitate the establishment of agreements and institutions for the management of shared watercourses;

-Advance the sustainable, equitable and reasonable utilization of shared watercourses;

-Promote coordinated, integrated and environmentally-sound development and management of shared watercourses;

-Promote the harmonization and monitoring of legislation and policies for planning, development, conservation and protection of shared watercourses, and allocation of the resources;

-Promote research and technology development, information exchange, capacity building, and the application of appropriate technologies in shared watercourses management.

4. SOURCES

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