Water Risk Filter

Country Overview - Cyprus

Water Indicators

Indicator	Value	Description	Source
Overall Basin Risk (score)	2.71	Overall Basin Risk (score)	
Overall Basin Risk (rank)	81	Overall Basin Risk (rank)	
Physical risk (score)	3.22	Physical risk (score)	
Physical risk (rank)	25	Physical risk (rank)	
Regulatory risk (score)	1.45	Regulatory risk (score)	
Regulatory risk (rank)	171	Regulatory risk (rank)	
Reputation risk (score)	2.46	Reputation risk (score)	
Reputation risk (rank)	125	Reputation risk (rank)	
1. Quantity - Scarcity (score)	3.59	1. Quantity - Scarcity (score)	
1. Quantity - Scarcity (rank)	27	1. Quantity - Scarcity (rank)	
2. Quantity - Flooding (score)	2.02	2. Quantity - Flooding (score)	
2. Quantity - Flooding (rank)	161	2. Quantity - Flooding (rank)	
3. Quality (score)	4.00	3. Quality (score)	
3. Quality (rank)	26	3. Quality (rank)	
4. Ecosystem Service Status (score)	2.67	4. Ecosystem Service Status (score)	
4. Ecosystem Service Status (rank)	74	4. Ecosystem Service Status (rank)	
5. Enabling Environment (Policy & Laws) (score)	1.00	5. Enabling Environment (Policy & Laws) (score)	
5. Enabling Environment (Policy & Laws) (rank)	178	5. Enabling Environment (Policy & Laws) (rank)	
6. Institutions and Governance (score)	2.00	6. Institutions and Governance (score)	
6. Institutions and Governance (rank)	160	6. Institutions and Governance (rank)	
7. Management Instruments (score)	1.60	7. Management Instruments (score)	
7. Management Instruments (rank)	168	7. Management Instruments (rank)	
8 - Infrastructure & Finance (score)	1.00	8 - Infrastructure & Finance (score)	
8 - Infrastructure & Finance (rank)	181	8 - Infrastructure & Finance (rank)	
9. Cultural Diversity (score)	3.00	9. Cultural importance (score)	
9. Cultural Diversity (rank)	50	9. Cultural importance (rank)	
10. Biodiversity Importance (score)	3.50	10. Biodiversity importance (score)	

Water Risk Filter

Country Overview - Cyprus

Indicator	Value	Description	Source
10. Biodiversity Importance (rank)	91	10. Biodiversity importance (rank)	
11. Media Scrutiny (score)	1.55	11. Media Scrutiny (score)	
11. Media Scrutiny (rank)	190	11. Media Scrutiny (rank)	
12. Conflict (score)	3.10	12. Conflict (score)	
12. Conflict (rank)	40	12. Conflict (rank)	
1.0 - Aridity (score)	2.80	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)	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.
1.1 - Water Depletion (score)	3.00	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)	42	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)	4.00	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)	16	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)	3.68	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)	49	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)	3.81	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)	3	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)	3.68	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)	39	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)	5.00	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)	5	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)	1.99	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)	161	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)	2.64	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)	69	This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP). The magnitude of the flood event was defined based on 100-year return period for pre-industrial conditions. Results are expressed in terms of change (%) in probability between pre-industrial and 2°C scenarios.	Frieler, K., Lange, S., Piontek, F., Reyer, C. P., Schewe, J., Warszawski, L., ... & Geiger, T. (2017). Assessing the impacts of 1.5 C global warming–simulation protocol of the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP2b). Geoscientific Model Development.
3.1 - Surface Water Contamination Index (score)	4.00	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)	26	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)	3.00	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)	67	This risk indicator is based on the data set by Grill et al. (2019) mapping the world's free-flowing rivers. Grill et al. (2019) compiled a geometric network of the global river system and associated attributes, such as hydro-geometric properties, as well as pressure indicators to calculate an integrated connectivity status index (CSI). While only rivers with high levels of connectivity in their entire length are classified as free-flowing, rivers of CSI < 95% are considered as fragmented at a certain degree.	Grill, G., Lehner, B., Thieme, M., Geenen, B., Tickner, D., Antonelli, F., ... & Macedo, H. E. (2019). Mapping the world's free-flowing rivers. Nature, 569(7755), 215.
4.2 - Catchment Ecosystem Services Degradation Level (tree cover loss) (score)	1.30	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)	129	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)	4.93	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)	8	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)	1.00	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)	169	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)	159	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)	1.00	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)	175	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)	119	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.

Indicator	Value	Description	Source
6.2 - Freedom in the World Index (rank)	144	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)	158	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)	1.00	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)	166	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)	78	This risk indicator is based on the data set by UN IGRAC (2019) to determine the level of availability of groundwater monitoring data at country level as groundwater management decisions rely strongly on data availability. The level of groundwater monitoring data availability for groundwater management is determined according to a combination of three criteria developed by WWF and IGRAC: 1) Status of country groundwater monitoring programme, 2) groundwater data availability for NGOs and 3) Public access to processed groundwater monitoring data.	UN IGRAC (2019). Global Groundwater Monitoring Network GGMN Portal. UN International Groundwater Resources Assessment Centre (IGRAC).
7.3 - Density of Runoff Monitoring Stations (score)	3.00	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)	123	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)	126	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)	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.

Indicator	Value	Description	Source
8.2 - Access to Sanitation (rank)	145	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)	1.00	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)	179	This risk indicator is based on the average 'Financing' score of UN SDG 6.5.1. Degree of IWRM Implementation database. UN SDG 6.5.1 database contains a category on financing which assesses different aspects related to budgeting and financing made available and used for water resources development and management from various sources.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
9.1 - Cultural Diversity (score)	3.00	Water is a social and cultural good. The cultural diversity risk indicator was included in order to acknowledge that businesses face reputational risk due to the importance of freshwater for indigenous and traditional people in their daily life, religion and culture. This risk indicator is based on Oviedo and Larsen (2000) data set, which mapped the world's ethnolinguistic groups onto the WWF map of the world's ecoregions. This cross-mapping showed for the very first time the significant overlap that exists between the global geographic distribution of biodiversity and that of linguistic diversity.	Oviedo, G., Maffi, L., & Larsen, P. B. (2000). Indigenous and traditional peoples of the world and ecoregion conservation: An integrated approach to conserving the world's biological and cultural diversity. Gland: WWF (World Wide Fund for Nature) International.
9.1 - Cultural Diversity (rank)	50	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)	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. 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)	82	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)	3.00	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)	106	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)	2.00	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)	188	This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware local residents typically are of water-related issues due to national media coverage. The status of the river basin (e.g., scarcity and pollution) is taken into account, as well as the importance of water for livelihoods (e.g., food and shelter).	WWF & Tecnoma (TYPSA Group)
11.2 - Global Media Coverage (score)	1.00	This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware people are of water-related issues due to global media coverage. Familiarity to and media coverage of the region and regional water-related disasters are taken into account.	WWF & Tecnoma (TYPSA Group)
11.2 - Global Media Coverage (rank)	166	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)	2.00	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)	133	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)	4.20	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)	7	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 (#)	1170125	Population, total	The World Bank 2018, Data , hompage accessed 20/04/2018
GDP (current US$)	20047013274	GDP (current US$)	The World Bank 2018, Data , hompage accessed 20/04/2018
EPI 2018 score (0-100)	72.60	Environmental Performance Index	
WGI -Voice and Accountability (0-100)	65.71	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

Indicator	Value	Description	Source
WGI -Political stability no violence (0-100)	82.76	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)	78.37	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)	82.69	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)	75.48	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132
WGI - Control of Corruption (0-100)	77.88	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
WRI BWS all industries (0-5)	5.00	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)	1	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)	0	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)	0	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)	0	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 - Cyprus

Indicator	Value	Description	Source
Baseline Water Stress (BWS) - 2030 BAU (increasing rank describes lower risk)	0	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)	0	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)	0	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)	0	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)	0	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)	0	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.

Country Overview - Cyprus

Indicator	Value	Description	Source
Total water footprint of national consumption (m3/a/cap)	2385.40	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 (%)	71.30	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)	39.54	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)	55.46	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 (%)	81.90	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)	0.78	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)	0.00	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)	0.78	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 - Cyprus

Indicator	Value	Description	Source
Total renewable water resources (10^9 m3/year)	0.78	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Dependency ratio (%)	0.00	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)	669.50	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]	5.76	WorldHappinessReport.org	World Happiness Report, homepage accessed 20/04/2018

Country Aspects

1. PHYSICAL ASPECTS

1.1. WATER RESOURCES

1.1.1. WATER RESOURCES

A water balance cannot be easily calculated for the government-controlled area of Cyprus. A water balance for the whole island, however, indicates 900 million m3/year of renewable water resources. Surface runoff is estimated at about 830 million m3/year. The natural aquifer recharge is estimated at 300 million m3, of which about 70 million m3 flows to the sea and 100 million m3 emerges from springs.

There are 14 main rivers, none of which provides perennial flow. The source of water for these rivers originates in the Troodos mountains. The main groundwater aquifers are the Western Mesaoria (Morphou), Kokkinochoria (south-eastern and eastern Mesaoria) and Akrotiri. Smaller aquifers exist in other parts of the country.

In 1995, total dam capacity reached 299 million m3 on the whole island, up from 6 million m3 in 1961 and 64 million m3 in 1974. New dams for storing water for irrigation are planned, particularly in Paphos province in the southwestern part of the island. Additional dams are also planned for Lefkosia province in the centre of the island, but a substantial quantity of this water will be diverted for domestic and industrial use and to compensate for the loss of water recharge downstream of the dams.

Currently, some 40 million m3 of wastewater is produced annually on the whole island. Only 16 million m3 of this amount is treated, mainly in Leflkosia province, where the city of Nicosia is located. Nicosia has a city-wide sewage processing plant, part of which is not under government control. About 11 million m3 is reused for irrigation purposes, mainly in the part of the island that is not under government control around the mentioned city. Only 1 million m3/year is reused for the irrigation of hotel gardens and recreation areas in the government-controlled area. There are also other sewage plants in use, such as that located in Limassol or in Larnaca.

Cyprus is the third largest island in the Mediterranean Sea, with an area of 9,251km2. Like other countries in the Mediterranean region, Cyprus has a semi-arid climate and limited water resources. The island's state forests cover about 18 per cent of its surface and are mainly confined to the Troodos mountain range in the central part of the island and the Pentadaktylos mountain range in the northern part. The conservation of the island's forests has multiple objectives, such as the conservation of biological diversity, the protection of the soil against erosion, the control of floods and the protection of water resources. The Troodos mountain range is of particularly high ecological significance, not only because it contains rich plant and avian diversity, but also because it feeds most river basins and aquifers of the island, with maximum precipitation of 1,000mm/year. Eighty per cent of surface runoff in Cyprus is generated by the Troodos mountains. Due to the rainfall conditions, surface water is confined to only a few months a year (MANRE, 2004).

1.1.2. WATER USE

In 1993, total water withdrawal in the government-controlled area was 211 million m3, of which 74 per cent was for agricultural purposes, including both irrigation (70.6 per cent) and livestock (3.3 per cent). Water withdrawal for domestic and industrial use in 1993 was 23.7 per cent and 2.4 per cent respectively. The trend in recent years, which is likely to continue in the future, has been that increasing quantities of water are used for domestic water supplies at the expense of agriculture. This has been necessary in view of an increasing standard of living, an expansion of tourist services, and industrialization.

Considering the whole island, 70 million m3 of groundwater flows to the sea yearly and 270 million m3 is either pumped out or emerges from springs, leading to total extraction from the aquifers of 340 million m3/year. As the annual recharge has been estimated at 300 million m3, there could be up to 40 million m3/year of excess pumping over natural recharge. As a result, the total area of Cyprus is experiencing a gradual decline in groundwater yield, a lowering of the water table and, in certain cases, sea water intrusion.

According to MANRE (2004), the two main water-consuming sectors in Cyprus are irrigated agriculture and domestic use. Agriculture accounts for about 70 per cent of total water use, while the domestic sector accounts for 20 per cent. Other sectors include tourism (5 per cent), industry (1 per cent), and amenities (5 per cent). Today the total water demand in Cyprus amounts to 265.9 million m3 annually. It is estimated that, by 2020, water demand in Cyprus will increase to 313.7 million m3, mainly as a result of a rise in the use of domestic water and tourism development (Water Development Department and FAO, 2002). This presents many challenges for water management and conservation in Cyprus.

There is increasing concern regarding the effective and efficient utilization of water for agriculture and water conservation in general (Chimonidou et al, 2009). The promotion of effective water use and on-farm water management were identified as important contributions to the management strategy (Chimonides, 1995) needed to address problems of water scarcity and promote the practice of intensive agriculture on environmentally sound grounds. Improving water use efficiency at farm level would be a major factor in increasing food production and reversing the degradation of the environment (Papadopoulos, 1996). The overall target is to maximize the positive impacts of irrigation and minimize potential environmental hazards (Chimonidou, D. et al, 2009). The interaction between agricultural production and the environment should be complementary rather than competitive for the balanced development of both. In scheduling irrigation it is important to identify the critical periods during which plant water stress has the most pronounced effect on growth and yield of crops, since this is directly related to the nutrients required by the crop (Chimonidou, 1996).

The government decided to improve the situation by creating and strengthening, through the provision of personnel and equipment, the Water Use Section of the Department of Agriculture in 1960 and by implementing the Water Use Improvement Project in 1965 and Water Supply (Special Measures) Law No. 35 of 1965 (Chimonidou, D. et al, 2009). With the creation of the Agricultural Research Institute in 1965, experiments were carried out concering basic concepts of soil-water-plant relationships (Chimonides, 1995).

According to Chimonidou et al (2009), the percentages of water demand for permanent and annual crops are 59 per cent and 41 per cent respectively. Of 351km2 of irrigated crops, 191km2 are temporary crops and 160km2 permanent crops. The main irrigated temporary crops are vegetable and melons (27.6 per cent), followed by fodder crops (12.8 per cent) and cereals (11.4 per cent). The main irrigated permanent crops are citrus (15.3 per cent), fresh fruit (10.2 per cent), olives and carobs (9.4 per cent) and vines (7.1 per cent) (Agricultural Statistics, 2002).

A percentage of the annual amount of water used for irrigation purposes is provided by government irrigation schemes. In these schemes, the sources of water used are surface water, groundwater and reclaimed water. As a rule, water demand in the non-government schemes is satisfied by groundwater (Chimonidou et al, 2009).

Although the capacity of all Cyprus' main dams is 273.6 million m3, the average annual amount of water available for use is estimated to be about 112.5 million m3. Of the 112.5 million m3, 93 million m3 is used by government projects, 14.5 million m3 for domestic use (after treatment) and 5 million m3 for ecological areas (Chimonidou et al, 2009).

During the dry year of 2005, the contribution to irrigation of all dams was 63 million m3 while in 2006 it was only 39.5 million m3. Today the situation is problematic, as the stored capacity of the dams is only 13.5 million m3 (August 2008) (Chimonidou et al, 2009).

Groundwater extraction is estimated to be about 127.4 million m3 annually (this figure does not represent the safe yield of the aquifers, which is much lower). Of this amount, 100.4 million m3 is used for agriculture (26 million m3 within government irrigation schemes and 74.4 million m3 outside) (Chimonidou et al, 2009).

Springs contribute very little, amounting to 3.5 million m3 per year, mainly for domestic use in the mountainous villages. At present, desalination units contribute up to 33.5 million m3 per year. Presently, only about 3.5 million m3 is used, of which 2 million m3 is for agriculture and the rest for landscape irrigation (Chimonidou et al, 2009).

1.2. WATER QUALITY, ECOSYSTEMS AND HUMAN HEALTH

Waterlogging, soil salinization and vector-borne diseases are not present in Cyprus. Contamination of groundwater, especially with fertilizers (particularly nitrates) in certain areas of the island where agriculture is intensively practiced, does, however, occur and is a cause of concern. There is also the problem of seawater intrusion in the main coastal aquifers. This situation requires close monitoring.

One of the main water quality problems in Cyprus is water salinization owing to a combination of seawater intrusion, natural saline waters and anthropogenic sources such as agricultural return flows enriched with nitrates, pesticides and insecticide residues from agricultural activities (Socratous, 2000).

2. GOVERNANCE ASPECTS

2.1. WATER INSTITUTIONS

The Ministry of Agriculture, Natural Resources and Environment is responsible, through a number of departments, for water resources assessment and development. The Water Development Department (WDD) assesses the surface water resources (groundwater resources are assessed by the Geological Survey Department), plans the water development projects, develops engineering studies (including civil works) and operates and maintains these projects. Project construction is usually subcontracted to the private sector, following bids. The WDD also has responsibility for recommending plans to the government for the allocation of water resources and for water rates. For irrigation purposes the water rates cannot legally exceed 40 per cent (65 per cent in exceptional cases) of the average total cost of water provision, including capital expenditure, as well as operation and maintenance expenditures (for domestic and industrial water supply the full costs is recovered). The Department of Agriculture has overall responsibility for improved irrigation practices at farm level and the Agricultural Research Institute is involved in all aspects of applied research with regard to irrigation methods, application rates etc.

The Ministry of the Interior also plays a key role. It is responsible for the implementation and enforcement of all water-related laws, as well as the issuing of groundwater permits and the registration of water rights. Officers of the Ministry of the Interior also act as Chairpersons of District Water Boards (for domestic water supply) and for the Irrigation Divisions. The Ministry is also involved in the Sewage Boards that manage the sewage systems of the largest towns. The Ministries of Agriculture and of the Interior work closely together and coordinate all aspects of water development and utilization.

2.2. WATER MANAGEMENT

At present, almost all the renewable water resources in Cyprus are utilized and, in a number of areas, groundwater is rapidly depleting, with sea water intrusion occurring in the main coastal aquifers of Morphou (western Mesaoria), Famagusta and Kokkinochoria (eastern Mesaoria) and Akrotiri. There is no accurate estimate of the quantity of water extracted in excess of natural recharge, but it could be as high as 40 million m3/year. Even so, in years of drought or below-average rainfall, it is necessary to divert water from agriculture to the domestic and industrial sector. In such cases it is necessary to restrict the amount of water made available for both annual and perennial crops. For instance, in the 1989-90 and 1990-91 seasons, annual crops were limited on average to 70 per cent of the normally irrigated land, whereas perennial crops received only 80 per cent of normal supply. A similar situation occurred in 1993.

This precarious situation is unlikely to change in the future, as almost all of the conventional water resources are already used. This includes water stored in dams on all rivers rising in the southern slopes of the Troodos Mountains. Other potential but smaller water storage schemes are planned for rivers arising from the northern slopes of the Troodos Mountains. These new schemes are unlikely to alter the quantity of water available for irrigation significantly (with the possible exception of the Paphos District), as water from most of these rivers currently recharges the aquifer downstream, which is already substantially utilized. Furthermore, water demand for domestic and industrial purposes will undoubtedly continue to increase and will receive priority over water demand for agricultural use. This leaves the use of treated wastewater as one of the main sources for increasing water supply for agriculture in the foreseeable future. In view of this restrictive situation, the government is considering alternative ways of increasing the water supply of the country. In this respect, in 1996 it awarded a contract for the construction of a desalination plant with a minimum capacity of 7 million m3/year.

Other possible steps and options will also have to be considered and/or evaluated. These include:

-the further minimization of water losses in the domestic water distribution system, which now average about 23 per cent, although this figure is already quite low (compared to a current average of 40 per cent for developing countries and 20 per cent for developed countries);

-the shifting of water from marginally economical agricultural activities to other uses, especially to domestic use, thus eliminating the water subsidy;

-the inter-regional transfer of water from the better-endowed western part (i.e. Paphos) to the eastern districts, albeit at a high cost.

Additional integral components of the government's water resources management policy will be the improvement of the water delivery system in the hilly areas, and further overall water savings through increases in the price of irrigation water (at present covering 34 per cent of the average cost of water provision) to the maximum allowed by the existing legislation. In both cases, however, the resulting water savings will be minimal.

According to MANRE (2004), following the independence of Cyprus in 1960, the government of Cyprus placed great importance on water management in order to secure an adequate supply of good-quality water to the island’s inhabitants. The main policy of the government, implemented through the Water Development Department, was to increase water supply by constructing dams and conveyance infrastructure under the motto “No drop of water to the sea”. Due to this policy, the capacity of dams increased from 6 million m3 in 1960 to more than 307.5 million m3 today.

Additional measures were implemented, including the construction of water treatment plants and the drilling of boreholes to provide water for domestic use and irrigation. The government also encouraged the installation of improved farm irrigation systems, promoted the application of leakage detection methods on water distribution systems, and imposed a water charge for domestic and irrigation water (MANRE, 2004).

Despite these measures, there was still insufficient water to satisfy increasing water demand, while the depletion of water resources became more evident. Due to the limited supply of surface runoff in Cyprus, groundwater has traditionally provided the water needed for domestic use and irrigation (MANRE, 2004).

The groundwater resources of the island have historically been heavily overpumped, especially during periods of drought. It is estimated that groundwater resources are overexploited by about 40 per cent of the sustainable extraction level. The existing conditions have resulted in saline water intrusion and consequent quality deterioration in coastal aquifers and the depletion of inland aquifers. Seawater intrusion in aquifers has also resulted in valuable underground water storage room being damaged. Furthermore, intensive agriculture and excessive use of fertilizers have resulted in nitrate pollution of many aquifers (MANRE, 2004). Similar nitrate pollution problems appear in aquifers in inhabited areas because of direct sewage disposal in adsorption pits (Water Development Department and FAO, 2002).

Another problem faced by Cyprus is the increased frequency and intensity of droughts during the last 30 years. Furthermore, the level of precipitation has decreased during the last century. Statistical analysis of the precipitation records available over the period of the hydrological years 1916-17 to 1999-2000 showed that the mean precipitation of recent years (1970-71 to 1999-2000) is lower than the mean precipitation of earlier years (191-17 to 1969-70). The shift in mean precipitation was found to be larger in the Troodos Mountains than in the coastal areas and inland plains. This analysis does not prove that the recorded decrease in annual precipitation is due to climate change, but this possibility is not excluded (Water Development Department and FAO, 2002). It is estimated that the decrease in precipitation resulted in a 40 per cent reduction of surface runoff. Due to the over-utilization of existing water resources, the environmental and social impacts of droughts also intensified. In the years 1990-91 and 1996-2000 Cyprus faced a water crisis as a result of drought, forcing the government to impose restrictions on water supply both for domestic and irrigation purposes, with adverse effects on the economy and social life (MANRE, 2004).

These conditions led the government of Cyprus to revise its general water policy in an effort to promote effective water governance and to ensure that every person had access to safe drinking water. New measures have included the treatment of municipal waste and the use of tertiary treated water in agriculture and for groundwater recharge, and the introduction of desalination, which has enabled the government to provide a continuous supply of drinking water to all towns and villages (MANRE, 2004)

At the same time, keen efforts have been undertaken towards saving water through public education and awareness campaigns. In addition, several revisions have been made in the existing legal and institutional framework in order to create an enabling environment for the implementation of integrated water management and the conservation of water-related ecosystems (MANRE, 2004).

According to Chimonidou et al (2009), in making the supply meet the demand, the Government policy has encouraged and adopted such management measures as water rationing, the promotion of public awareness of water conservation measures, and water pricing.

Water rationing has been extensively applied in an attempt to curtail demand in periods of drought. This has allowed the authorities in recent years to reduce water demand by 30 per cent for domestic purposes and by 50 percent for irrigation purposes. Other water conservation measures include subsidies for the use of inferior-quality groundwater and the treatment of grey water from households for the flushing of toilets and irrigation of house gardens in the cities (Chimonidou et al, 2009).

Furthermore, the campaign to raise the 'water awareness' of the public proved to be successful. Water pricing is now an integral part of government policy on water. Water for municipal use, including industrial, commercial and tourism purposes, is sold at full cost, while irrigation water is subsidized by as much as 77 per cent. The government's policy towards agriculture is very generous, which has contributed to the use of inefficient cropping patterns and even to the wastage of water. It should be noted that in the last six years the water tariff for the domestic sector has not reflected the full cost. The subsidy is as high as 34 per cent (Chimonidou et al, 2009). The current prices of water to the agriculture and domestic sectors are 6.5c/m3 and 33.5c/m3 respectively (Socratous, 2003).

The disruption of the water supply from the governmental water works forced greenhouse growers to use saline water from boreholes, which had a negative impact on soil salinity. The poor water quality led the growers to develop the technique of water purification through reverse osmosis. This technology utilizes about 60 per cent of the water and the rest, which is heavily loaded with salts, is returned to the environment, causing pollution problems (Chimonidou et al, 2009).

The Ministry of Agriculture, Natural Resources and Environment has announced other measures for saving drinking water, such as periodic water supply to households, subsidies for the excavation of private drills for irrigation and other domestic purposes, promotion of the installation of domestic water recycling systems, and the launch of public-awareness campaigns (Chimonidou et al, 2009).

2.3. WATER POLICY AND LEGAL FRAMEWORK

The main laws concerned with irrigation date back to before independence in 1961, and include: the Government Water Works Law (Cap 341 of 1928), which provides for the control of water and the construction of water works by the government; the Wells Law (Cap 351 of 1946), which covers the installation of wells and related water rights; and the Irrigation Divisions (Cap 342 of 1938), which regulates the formation of Irrigation Divisions and their operation. The laws, in general, function effectively and, in the case of the Water Laws, cover all aspects of water development as well as interactions between government and users. All land in Cyprus is registered and owners have deeds or certificates of ownership.

Responsibility for water management has traditionally been divided between different ministries exercising overlapping jurisdictions. This has sometimes resulted in the duplication of activities or the failure to take appropriate measures for effective water management. Efforts are now focusing on establishing a new Directorate for Integrated Water Management, which, it is proposed, will manage the island's water resources within the framework of the national water policy in a holistic way. The Directorate will deal with the provision of water for domestic purposes and agriculture, control water extraction from surface and underground water systems, supervise the safety of dams and reservoirs through the formulation of an appropriate legal framework, and promote the conservation and management of water-related ecosystems. An advisory committee will be created, composed of key stakeholders in the water management sector, which will have an active role in the formulation and implementation of water-related policies. The Directorate for Integrated Water Management will be based on the existing Water Development Department within the Ministry of Agriculture, Natural Resources and Environment (MANRE, 2004).

In recent years, in view of the accession of Cyprus to the European Union, the Ministry of Agriculture, Natural Resources and Environment has been endeavouring to comply with EU policies and Directives. The two main Directives that concern water conservation and management are the Habitats Directive (92/43/EEC) and the Water Framework Directive (2000/60/EC). Both of these Directives support an integrated approach to nature conservation and water management, placing the conservation of ecosystems at the centre of activity and emphasizing the need to work together with local communities and other stakeholders to obtain best results (MANRE, 2004).

The Habitats Directive is the EU's main policy with regard to nature conservation. Its main objective is the conservation of biological diversity "through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States to which the Treaty applies" (Council Directive 92/43/EEC, Article 2, Paragraph 1). Member states are required to compile national lists of important habitats and species and submit them to the European Commission, which is responsible for verifying that the lists are adequate. Each member state must then designate the sites as Special Areas of Conservation (SACs) and design management plans for their conservation, where necessary. All designated sites across Europe will form an ecological network of protected areas known as Natura 2000. The main agency responsible for implementing the Habitats Directive is the Environment Service of the Ministry of Agriculture, Natural Resources and Environment (MANRE, 2004).

The Habitats Directive does not call for the exclusion of all human activities from the Natura 2000 sites, but human needs must not underpin the conservation objectives of the protected area (MANRE, 2004).

In complying with the Habitats Directive, Cyprus has already compiled national lists of important habitats and species. Certain areas of the Troodos Mountains have been included in the list of important areas for conservation. The list of important areas for Cyprus also includes other forest areas, lakes and wetlands. By restricting mass-scale development in the selected Natura 2000 areas, the Habitats Directive can be a positive step towards the conservation of water-related ecosystems (MANRE, 2004).

The Water Framework Directive has established the objectives and strategy for the sustainable use of water in all member states of the EU. Each member state has the responsibility to review the status and particularities of its water resources and develop its own national implementation strategy. In Cyprus, the provisions of the Water Framework Directive have been transposed into national legislation through the Water Protection and Management Law of 2004, which was adopted by the House of Representatives on 5 February, 2004. The two main agencies responsible for implementing the Water Framework Directive are the Water Development Department and Environment Service of the Ministry of Agriculture, Natural Resources and Environment (MANRE, 2004).

The Water Framework Directive requires that member states characterize river basin districts in terms of the pressures, impacts and economics of water uses, drawing up a register of the protected areas lying within each river basin district. An action plan for the creation of essential infrastructure in Cyprus is under preparation. In this context, the Water Development Department, in cooperation with the Department of Fisheries and Marine Research and the State General Laboratory, has submitted a proposal for the development of integrated water monitoring programmes and tools to the Transition Facility Programme of the European Union, for the total sum of €1,836,000 (EU €1,836,000 and €156,000 joint co-financing) (MANRE, 2004).

The future will present both challenges and opportunities for sustainable water management in Cyprus. The demand for water is expected to increase, placing additional pressures on the limited water resources of the island. Over the years, the government of Cyprus has recognized that placing emphasis solely on increasing the supply of water does not provide a sustainable solution for effective water management and conservation (MANRE, 2004). Through policy reforms and the implementation of European Union Directives, a more integrated approach to water management is now pursued, which emphasizes water conservation and the protection of water-related ecosystems. Furthermore, the involvement of different stakeholders in the decision-making process is increasingly recognized as an essential element of effective water management. As recent studies have shown, local communities in Cyprus wish to collaborate with government agencies and to participate in the conservation of the island's natural resources (Michaelidou and Decker, 2002).

Through citizen participation in water management and a genuine emphasis on the conservation of water-related ecosystems, Cyprus will be in a better position to meet the difficult challenge that lies ahead: to provide all people with sufficient, safe and reliable water for their domestic and irrigation needs, while safeguarding the natural environment (MANRE, 2004).

According to Chimonidou et al (2009), it is apparent, by a simple comparison of the supply and demand, that the current water situation is not sustainable. The recent droughts of 1989-91 and 1995-2006 demonstrate quite convincingly how critical the water situation may become. A new water policy is required that will bring about sustainability. The new water policy should pursue the following specific objectives (Chimonidou et al, 2009):

•securing additional sources of supply;
•ensuring efficient use of available water;
•modifying the current irrigation water allocation matrix;
•building up strategic water reserves;
•maintaining and enhancing the quality of water;
•introducing new effective and efficient management procedures through the establishment of a Water Entity.

These objectives should be holistically pursued. Each objective complements the others.

The basic water policy of the government is the production of desalinized sea water, the use of non-conventional sources such as recycled water for irrigation, recharge and amenity purposes, the desalting of brackish water, the efficient use of available water including the better use of pricing and water conservation measures, harmonization with European policy, the protection, preservation and improvement of water quality, the introduction of new effective management procedures through the establishment of a Water Entity, and the development of remaining existing water resources with the construction of dams until 2015 (Chimonidou et al, 2009).

The government's water policy focuses on the maximum exploitation of non-conventional water resources, such as recycled water. Tertiary treated recycled water is used for the irrigation of existing crop-land and for recharging aquifers. Full exploitation of recycled water is a long-term, costly process, the success of which would decrease or even eliminate the necessity of building more desalination plants (Chimonidou et al, 2009).

As regards the installation of central sewage collection and treatment systems within the framework of harmonization with European policy, a programme has been established for the installation of central sewage systems in all areas with populations of over 2,000 people. In parallel, the establishment of sewage systems in smaller rural communities that do not fall within the harmonization obligations (i.e. have populations of fewer than 2,000 people) is being promoted in order to meet these communities' sewage disposal problems (Chimonidou et al, 2009).

The construction of additional water works, such as new dams and an expanded of irrigation networks, as provided in the Strategic Water Development Plan for the period up to 2015, is also underway (Chimonidou et al, 2009).

In addition, the implementation of the Water Framework Directive constitutes an integral part of government policy. The objective of this Directive is the conservation, improvement and safeguarding of the good condition of water bodies (surface, groundwater and coastal) until 2015 and the development of a river basin management plan at river basin level (Chimonidou et al, 2009).

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