Water Risk Filter

Country Overview - Israel

Water Indicators

Indicator	Value	Description	Source
Overall Basin Risk (score)	3.20	Overall Basin Risk (score)	
Overall Basin Risk (rank)	13	Overall Basin Risk (rank)	
Physical risk (score)	3.80	Physical risk (score)	
Physical risk (rank)	2	Physical risk (rank)	
Regulatory risk (score)	1.33	Regulatory risk (score)	
Regulatory risk (rank)	180	Regulatory risk (rank)	
Reputation risk (score)	3.28	Reputation risk (score)	
Reputation risk (rank)	30	Reputation risk (rank)	
1. Quantity - Scarcity (score)	4.41	1. Quantity - Scarcity (score)	
1. Quantity - Scarcity (rank)	2	1. Quantity - Scarcity (rank)	
2. Quantity - Flooding (score)	3.75	2. Quantity - Flooding (score)	
2. Quantity - Flooding (rank)	61	2. Quantity - Flooding (rank)	
3. Quality (score)	3.12	3. Quality (score)	
3. Quality (rank)	87	3. Quality (rank)	
4. Ecosystem Service Status (score)	2.58	4. Ecosystem Service Status (score)	
4. Ecosystem Service Status (rank)	83	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)	173	5. Enabling Environment (Policy & Laws) (rank)	
6. Institutions and Governance (score)	1.50	6. Institutions and Governance (score)	
6. Institutions and Governance (rank)	173	6. Institutions and Governance (rank)	
7. Management Instruments (score)	1.70	7. Management Instruments (score)	
7. Management Instruments (rank)	163	7. Management Instruments (rank)	
8 - Infrastructure & Finance (score)	1.00	8 - Infrastructure & Finance (score)	
8 - Infrastructure & Finance (rank)	177	8 - Infrastructure & Finance (rank)	
9. Cultural Diversity (score)	2.00	9. Cultural importance (score)	
9. Cultural Diversity (rank)	95	9. Cultural importance (rank)	
10. Biodiversity Importance (score)	2.12	10. Biodiversity importance (score)	

Indicator	Value	Description	Source
10. Biodiversity Importance (rank)	180	10. Biodiversity importance (rank)	
11. Media Scrutiny (score)	4.00	11. Media Scrutiny (score)	
11. Media Scrutiny (rank)	8	11. Media Scrutiny (rank)	
12. Conflict (score)	3.37	12. Conflict (score)	
12. Conflict (rank)	23	12. Conflict (rank)	
1.0 - Aridity (score)	3.58	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)	27	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)	4.00	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)	4	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)	4.55	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)	7	World Resources Institute's Baseline Water Stress measures the ratio of total annual water withdrawals to total available annual renewable supply, accounting for upstream consumptive use. A higher percentage indicates more competition among users.	Hofste, R., Kuzma, S., Walker, S., ... & Sutanudjaja, E.H. (2019). Aqueduct 3.0: Updated decision relevant global water risk indicators. Technical note. Washington, DC: World Resources Institute.
1.3 - Blue Water Scarcity (score)	4.63	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)	22	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)	3.42	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)	7	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)	5.00	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)	3	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)	3	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)	3.89	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)	55	This risk indicator is based on the recurrence of floods within the 34-year time frame period of 1985 to 2019. The occurrence of floods within a given location was estimated using data from Flood Observatory, University of Colorado. The Flood Observatory use data derived from a wide variety of news, governmental, instrumental, and remote sensing source.	Brakenridge, G. R. (2019). Global active archive of large flood events. Dartmouth Flood Observatory, University of Colorado.

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2.2 - Projected Change in Flood Occurrence (by ~2050) (score)	1.08	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)	181	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)	3.12	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)	87	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)	2.99	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)	73	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)	1.06	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)	141	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)	4.51	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)	17	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)	158	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)	143	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)	167	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)	2.00	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)	161	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.

Country Overview - Israel

Indicator	Value	Description	Source
6.2 - Freedom in the World Index (rank)	133	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)	140	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)	154	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)	32	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)	3.64	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)	79	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)	94	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)	121	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)	172	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)	2.00	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)	95	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)	2.70	The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Companies operating in basins with higher number of endemic fish species are exposed to higher reputational risks.	WWF & TNC (2015). Freshwater Ecoregions of the World.

Indicator	Value	Description	Source
10.1 - Freshwater Endemism (rank)	150	The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Companies operating in basins with higher number of endemic fish species are exposed to higher reputational risks.	WWF & TNC (2015). Freshwater Ecoregions of the World.
10.2 - Freshwater Biodiversity Richness (score)	1.53	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.
10.2 - Freshwater Biodiversity Richness (rank)	177	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)	4.00	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)	11	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)	4.00	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)	7	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)

Indicator	Value	Description	Source
12.1 - Conflict News Events (RepRisk) (score)	3.00	This risk indicator is based on 2018 data collected by RepRisk on counts and registers of documented negative incidents, criticism and controversies that can affect a company's reputational risk. These negative news events are labelled per country and industry class.	RepRisk & WWF (2019). Due diligence database on ESG and business conduct risks. RepRisk.
12.1 - Conflict News Events (RepRisk) (rank)	63	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)	3.74	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)	12	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 (#)	8547100	Population, total	The World Bank 2018, Data , hompage accessed 20/04/2018
GDP (current US$)	317744784695	GDP (current US$)	The World Bank 2018, Data , hompage accessed 20/04/2018
EPI 2018 score (0-100)	75.01	Environmental Performance Index	
WGI -Voice and Accountability (0-100)	18.57	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132

Water Risk Filter

Country Overview - Israel

Indicator	Value	Description	Source
WGI -Political stability no violence (0-100)	71.92	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)	88.94	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)	87.50	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)	81.25	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132
WGI - Control of Corruption (0-100)	81.73	Water Governance Indicator	Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682132

Country Overview - Israel

Indicator	Value	Description	Source
WRI BWS all industries (0-5)	4.83	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)	21	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)	8	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)	9	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)	8	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 - Israel

Indicator	Value	Description	Source
Baseline Water Stress (BWS) - 2030 BAU (increasing rank describes lower risk)	8	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)	8	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)	8	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)	8	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)	8	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)	8	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 - Israel

Indicator	Value	Description	Source
Total water footprint of national consumption (m3/a/cap)	2302.70	WFN Water Footprint Data	Mekonnen, M.M. and Hoekstra, A.Y. (2011) National water footprint accounts: The green, blue and grey water footprint of production and consumption, Value of Water Research Report Series No. 50, UNESCO-IHE, Delft, the Netherlands.http://www.waterfootprint.org/Reports/Report50-NationalWaterFootprints-Vol1.pdf
Ratio external / total water footprint (%)	81.53	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)	225.00	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)	225.00	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 (%)	80.67	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)	0.02	World Development Indicators	The World Bank 2018, Data , hompage accessed 20/04/2018
Total internal renewable water resources (IRWR) (10^9 m3/year)	0.75	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)	1.03	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)	0.75	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13

Country Overview - Israel

Indicator	Value	Description	Source
Total renewable water resources (10^9 m3/year)	1.78	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Dependency ratio (%)	57.87	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)	220.70	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]	7.19	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 only river in Israel is the Jordan. The main sources of fresh water in Israel include:
-Lake Kinneret or Lake Tiberias (the Sea of Galilee), which divides the upper and lower portions of the Jordan River system. It is the only natural freshwater lake in Israel. It has traditionally provided about a third of the country's domestic, agricultural and industrial water requirements. Lake Tiberias' catchment area is 2,730km2 and the surface area of the lake is 165km2 with an estimated storage volume of 710 million m3. Lake Tiberias is the lowest freshwater lake in the world. The total average annual inflow of water into Lake Tiberias amounts to 1km3, of which around 250 million m3 serve consumers in the region, about 450 million m3 are withdrawn from the lake to serve consumers throughout the country by means of the National Water Carrier and about 300 million m3 are lost by evaporation. The water level has been traditionally regulated between 209m and 213m below sea level.
-The Coastal Aquifer is a sandstone aquifer which extends along 120 kilometres of the Mediterranean coastline. It is naturally recharged by precipitation and artificially recharged by water from the National Water Carrier, effluents and excess irrigation water percolating from agricultural, industrial and domestic land uses as well as from streams and wadis. The aquifer is also a valuable storage basin since sandstone layers hold water efficiently. It has a mean annual recharge of 250 million m3 in addition to 50 million m3 of agricultural drainage water.
-The Mountain Aquifer (Yarkon-Taninim) is a limestone aquifer which underlies the foothills in the centre of the country. The basin is comprised of three subaquifers: the Western Basin, known as the Yarkon Taninim Aquifer, flows north and westward and discharges in the Taninim Springs on the Mediterranean coast while the Northeastern and Eastern Basins discharge in the Beit Shean Springs and the Jordan Rift Valley and Dead Sea. The Yarkon Taninim Aquifer is regenerated by precipitation with an average of annual renewable recharges of about 350 million m3.
-Relatively smaller aquifers are located in Western Galilee, Eastern Galilee, the Jordan Rift, and the Arava Valley.
Total internal renewable water resources are estimated at 750 million m3/year. About 250 million m3 is surface water, 500 million m3 groundwater and the overlap between surface water and groundwater is considered to be negligible. Surface water entering the country is estimated at 305 million m3/year, of which 160 million m3 are from Lebanon (including 138 million m3 from Hasbani), 125 million m3 from the Syrian Arab Republic, and 20 million m3 from the West Bank. Groundwater entering the country is estimated at 725 million m3/year, of which 325 million m3 are from the West Bank, 250 million m3 from the Syrian Arab Republic (Dan Springs) and 150 million m3 from Lebanon (Lake Hulah). The total renewable water resources are thus 1,780 million m3/year, of which 92 per cent is considered to be exploitable. About 25 million m3/year of groundwater flow from the country to the Gaza Strip.
Mekorot, Israel's national water supply company, has built and operated small- and medium-size desalination facilities in the southern part of the country since the 1960s. Eilat at the southern tip of the country by the Red Sea was the first city to use desalination. Some 29 small plants generate 25 million m3 of water per year, mainly from brackish water. A decision to desalinate on a larger scale was taken in 2000 as a result of Israel's growing water scarcity. The national goal is to produce 750 million m3/year of desalinated water in 2020 (MAE, 2005). In the near future a string of desalination plants along the Mediterranean coast will produce 400 million m3 per year. One large plant for the desalination of seawater was recently completed on the Mediterranean coast, and is now producing 115 million m3 a year of potable water (MITL, 2008). Using the reverse osmosis process, this plant is generating water for about 60 cents per m3. All tenders issued for desalination facilities stipulate stringent threshold levels for water quality and provide incentives for even higher water qualities, especially in terms of chloride levels, in order to allow for irrigation without the attendant problem of soil salinity. In 2002, the total installed gross desalination capacity (design capacity) in Israel was 439,878 m3/day or 160.6 million m3/year (Wangnick Consulting, 2002).
Out of a total of 450 million m3 of sewage produced in Israel, about 96 per cent is collected in central sewage systems and 64 per cent of the effluents are reclaimed (290 million m3); 283 million m3 are adequately treated. Local authorities are responsible for the treatment of municipal sewage. In recent years, new or upgraded intensive treatment plants have been set up in municipalities throughout the country. The ultimate objective is to treat 100 per cent of Israel's wastewater to a level enabling unrestricted irrigation in accordance with soil sensitivity and without risk to soil and water sources (MOE, 2005a).

1.1.2. WATER USE

In 2004, water consumption amounted to 1.95km3, almost identical to 2000 and 11 per cent more than in 1986 (1.76km3). Agriculture accounted for 58 per cent whereas it was 64 and 71 per cent in 1993 and in 1983 respectively. Municipal use accounted for 36 per cent and industrial purposes for 6 per cent. Primary surface water and primary groundwater withdrawal amounted to almost 80 per cent of the total withdrawals.
Successive years of drought have dramatically lowered water levels in all of the main reservoirs. In fact, 1998/99 was the worst drought year in Israel for the past 100 years. The following years were also characterized by less than average rainfall which led to a shortfall of some 0.5 million m3 in Israel's water balance each year, in comparison to an average year. The winters of 2002/03 and

2003/04 were characterized by average and higher than average rainfall which led to a significant rise in the water level of Lake Tiberias and in the collection of floodwater in catchment reservoirs. However, the country's aquifers have remained depleted. It is estimated that increased water demand and decreased water availability has led to a cumulative deficit of nearly 2,000 million m3.
The National Water Carrier of Israel (in Hebrew commonly called HaMovil) is the main water project of Israel. Its main task is to transfer water from the rainy north of the country to the centre and arid south and to enable efficient use of water and regulation of water supply in the country. Most of the water works in Israel are combined with the National Water Carrier, the length of which is about 130km. Early plans were made before the establishment of the state of Israel but detailed planning started only after Israel's independence in 1948. The construction of the project started during the planning phase, long before the detailed final plan was completed and signed in 1956. The carrier consists of a system of aqueducts, tunnels, reservoirs and large-scale pumping stations. Building the carrier was a considerable technical challenge as it traverses a wide variety of terrains and elevations.
Water conservation is the most reliable and least expensive way to stretch the country's water resources, and the challenge is being met in all sectors. Public water conservation campaigns coupled with technical and economic measures are being applied to reduce consumption and to increase awareness of water scarcity. In agriculture, the wide scale adoption of low volume irrigation systems (e.g. drip, micro-sprinklers) and automation has increased the average efficiency to 90 per cent as compared to 64 per cent for furrow irrigation. As a result, the average requirement of water per unit of land area has decreased from 8,700m3/ha in 1975 to the current application rate of 5,500m3/ha. At the same time agricultural output has increased twelve-fold, while total water consumption by the sector has remained almost constant. In the domestic and urban sectors, conservation efforts are focused on improvements in efficiency, resource management, repair, control and monitoring of municipal water systems. Citizens are urged to save water. The slogan "Don't waste a drop" is known in every home in Israel. Parks have been placed under a conservation regime, including planting of drought-resistant plants and watering at night (Israel Ministry of Foreign Affairs, 2008).

1.2. WATER QUALITY, ECOSYSTEMS AND HUMAN HEALTH

Water quality is an issue of equal importance to water scarcity, and water quality degradation is a considerable issue in water management. The quality of supplied water in Israel varies from very low salinity water (10mg/l of chlorides) from the Upper Jordan River, 200mg/l from the Kinneret, and more than 1,500mg/l from groundwater sources in the south. Groundwater exploitation is controlled to prevent seawater intrusion to the Coastal Aquifer and movement of saline water bodies within the Karstic Limestone Aquifer (Israel Ministry of Foreign Affairs, 2008).
Israel's current water crisis is the result of both natural conditions (climate, geography and hydrology) and human activity. Natural constraints are exacerbated by anthropogenic impacts. Overpumping from aquifers to meet growing demands has led to the infiltration of seawater and salinity, the impoundment of springs has dried up perennial and ephemeral streams, and domestic, industrial and agricultural practices have contaminated water sources. The quality of the country's main water sources has been increasingly endangered by pollutant discharges from different sectors:
-The Coastal Aquifer is seriously threatened by chemical and microbial pollutants, salination, nitrates, heavy metals, fuels and toxic organic compounds. According to the most recent report of the Hydrological Service, about 15 per cent of the total amount of water pumped from the Coastal Aquifer does not comply with existing drinking water standards for chloride and nitrate concentrations. Average chloride concentrations in the coastal aquifer are increasing at an average rate of 2mg/l per year, reaching an average of 195mg/l in 2002/03. Chloride concentrations below 250mg/l and nitrate concentrations under 45mg/l exist in only 50 per cent of the water which is drawn from wells in the coastal basin. These concentrations are unsuitable for unrestricted agricultural irrigation. Nitrate concentrations in the Coastal Aquifer have increased considerably due to intensive use of fertilizers in agriculture and use of treated effluents for irrigation. Since 1950, average nitrate concentrations have increased from 30mg/l to 63mg/l today, with an annual rate of increase of about 0.6mg/l. Concentrations exceeding 70mg/l were measured in traditional agricultural areas in the centre of the country.
-Because of the deterioration in both the quantity and quality of the water in the Coastal Aquifer, the Yarkon-Taninim Aquifer is becoming a main supplier of drinking water in the country. Water levels in this aquifer have decreased while a gradual increase in chlorides has been noted over the years. This deep limestone aquifer is especially prone to contamination due to its karstic nature and the quick transit of pollutants through it. Overexploitation may lead to a rapid rate of saline water infiltration from surrounding saline water sources.
-Due to the continuous drop in water levels in Lake Tiberias since 1996, regulations have lowered the minimum "red line" from 213m below sea level to minus 215.5m in 2001. The risks associated with reduced water levels are enormous: ecosystem instability and deterioration of water quality, damage to nature and landscape assets, receding shorelines and adverse impacts on tourism and recreation. Salinity in the lake has been alleviated by diverting several major saline inputs at the northwest shore of the lake into a "salt water canal" leading to the southern Jordan River. This canal removes about 70,000 tonnes of salt (and 20 million m3 of water) from the lake each year. The salt water canal is also used to remove treated sewage from Tiberias and other local authorities along the western shoreline away from Lake Tiberias and into the Lower Jordan River. In the catchment area, a concerted effort has been made to lower the nutrient load by changing agricultural and irrigation practices, by cutting back the acreage of commercial fishponds and by introducing new management techniques. Sewage treatment plants were improved and a new drainage network that recycles most of the polluted water within the watershed was constructed. Around the lake, public and private beaches and recreation areas with appropriate sanitary facilities were developed. Pollution and sewage from settlements and fishponds near the shores were treated and diverted from the lake. Next year, Mekorot, the national water company, will begin to operate a purification plant which will filter the water pumped from Lake Tiberias and will allow Israel to comply with water turbidity standards set by the Ministry of Health.

The Dead Sea, located in the Syrian-African Rift Valley, is the lowest place on earth (416m below sea level). It is also the world's saltiest large water body, with a salt concentration 10 times higher than that of the Mediterranean Sea. The Dead Sea has been threatened since the mid-20th century by declining water levels, at a rate of over one metre per year. Over the past 30 years, the Dead Sea has lost some 25m, mainly because water which previously fed into the Dead Sea is now diverted from the Sea of Galilee and the Yarmouk River to supply fresh water to Israel, Jordan and the Syrian Arab Republic. Furthermore, Dead Sea brine is withdrawn from the Dead Sea to supply the potash industries in Israel and Jordan. This negative water balance, which is expected to increase in the future, has a significant impact on existing and future infrastructure and development plans, natural and landscape values, the image of the region and the lives of local residents (MOE, 2004).

In 2004 an important amendment to the 1959 Water Law was made, integrating nature's right to water and legitimizing this right statutorily. The Water Commission took a decision to allocate 50 million m3 per year of freshwater to nature rehabilitation in the future. However, until this commitment is realized, there is no choice but to discharge surplus high quality effluents into rivers and wetlands (MOE, 2005b).

Despite the limits on water withdrawal, due to global warming and frequent droughts, the natural flows are decreasing. At the same time, the influx of pollutants from human activity and negligence above the aquifers is increasing, resulting in the increase of mineral and other pollutants in the groundwater. Due to unbalanced exploitation and return flow from irrigation, an increase in the salinity of the groundwater has occurred in many wells. The most advanced technology and practices are being applied to protect and minimize the pollution of water resources. Water conservation maps, restricting land use activities above groundwater resources, were produced to protect the underlying resources. Regular monitoring of water resources, including water recharge, water table levels, abstraction, salinity (chlorides) and pollution (nitrates) data are regularly monitored and reported. The data provides an effective tool for influencing the planning, the development process, and permissible emission of pollutants to the environment (Israel Ministry of Foreign Affairs, 2008).

2. GOVERNANCE ASPECTS

2.1. WATER INSTITUTIONS

The Water Commission, previously under the Ministry of Agriculture and Rural Development (MARD) but now under the Ministry of National Infrastructures (MNI), implements the water law, plans, develops, allocates, and manages water, and sets and annually revises water prices with the approval of a special parliamentary committee. Apart from the MARD and MNI, the Ministry of Finance (MOF) and the Industry Ministry, Trade and Labour (MITL) also have a strong influence on the water sector. At the operational level, the Water Commission relies on Mekorot, a state-owned water company that produces and distributes around 70 per cent of the water supply in the country. Mekorot operates the National Water Carrier, the pipeline system that moves water southwards from Lake Galilee to the Negev desert. In recent years, Mekorot has also entered spheres such as urban water retail, sewerage treatment, and sea water desalination. The Water Commission receives technical planning as well as research and development support from Tahal, a large engineering consulting firm. Although this firm had been the official and sole water planner for the past 20 years or so, now it is made to compete with other engineering companies within Israel to obtain project contracts from government (World Bank, 1999).

The Agricultural Extension Service of MARD focuses on all subjects related to agriculture, in particular water management, the promotion of water-saving technologies and use of marginal water. It is financed by two sources: government funds (80 per cent) and non-government sources, mainly production and marketing boards (20 per cent). Generally services to farmers are free, although some supplementary advisory packages are provided upon specific request in exchange for payment.

The Ministry of Health (MOH) is responsible for the quality of drinking water in Israel. In order to assure water quality, the Ministry has promulgated regulations that specify water quality standards regarding its microbial, chemical, physical and radiological aspects.

The Yigal Allon Kinneret Limnological Laboratory (Israel Oceanographic and Limnological Research) carries out research aimed at understanding how present and future conditions might influence water quality and monitors major environmental factors which may affect the state of Lake Kinneret (Lake Tiberias).

2.2. WATER MANAGEMENT

Water is regarded as a national asset and is protected by law. Users receive their annual allocation from the Water Commission. The entire water supply is measured and payment is calculated according to consumption and water quality.

Urban users pay much higher fees for water than farmers, including a water reclamation levy. Farmers pay differential prices for potable water. The first 60 per cent of the allocation costs 20 cents per m3, 60 per cent to 80 per cent costs 25 cents, and 80 per cent to 100 per cent costs 30 cents per m3. This incremental price policy encourages water saving. Water scarcity and price policy necessitate the use of marginal water, such as brackish and reclaimed water. Brackish water is used for irrigation of salinity-tolerant crops like cotton. In several crops, such as tomatoes and melons, brackish water improves produce quality although lower yields are achieved. The use of reclaimed water for irrigation of edible crops requires a high level of purification. For that purpose, unique technology – Soil Aquifer Treatment (SAT) – is now being applied in the densely populated Dan region. After tertiary purification, the water percolates through sand layers, which serve as a biological filter, into the aquifer. From there it is pumped at nearly potable quality and can be used for unrestricted irrigation (MARD, 2006).

Groundwater and surface water are state property according to the Israel water law. Each year the Israel water commissioner allocates for each village an annual water quota for irrigation. Historically, initial quotas were determined according to factors such as total land suitable for irrigation, soil type, population size, location, water usage prior to 1959 and political affiliation of the village. Water quotas are adjusted periodically in order to take into consideration new water sources and new villages. The price of water is determined by the commissioner using a three-tier price system. These price levels are determined according to historical quotas. Thus, the allotment of irrigation water and water prices are assumed to be exogenous to the farmers (World Bank, 2007).

2.3. WATER POLICY AND LEGAL FRAMEWORK

Although water policy and administration are centralized with considerable political overtones, the water sector in Israel is subject to a much stronger economic influence than its counterparts in other countries. This is partly due to metered volumetric allocation and partly due to a relatively stricter economic water pricing system. While inter-sectoral water allocation is used to favour domestic and industrial sectors, water prices in these sectors are higher and cover full costs. Even though irrigation water is subsidized, the subsidy has declined from 75 to 50 per cent since progressive block rate pricing was introduced in 1987 that penalizes large and fresh water consumers. Water wastage is the least in all sectors and water productivity has increased more than 250 per cent in agriculture and 80 per cent in industry (World Bank, 1999).

The 1959 Water Law that made water a nationalized public good remains as the legal document for present water policy and water administration. According to that law, all water is the property of the state, including waste, sewer and runoff water that can be used commercially. A landowner does not own the water under his/her land. The Law also created a permanent body known as the Water Commissioner (see above) to oversee and allocate water rights.

Israel's Water Law includes sewage water in its definition of "water resources." National policy calls for the gradual replacement of freshwater allocations to agriculture by reclaimed effluents. In the year 2002, treated wastewater constituted about 24 per cent of consumption by the agricultural sector. It is estimated that effluents will constitute more than 40 per cent of the water supplied to agriculture in 2010 (CBS, 2006).

3. GEOPOLITICAL ASPECTS

In 1951, Jordan announced its plan to divert part of the Yarmouk River via the East Ghor Canal to irrigate the East Ghor area of the Jordan Valley. In response, Israel began construction of its National Water Carrier (NWC) in 1953, resulting in military skirmishes between Israel and the Syrian Arab Republic. In 1955, the Johnston Plan called for the allocation of 55 per cent of available water in the Jordan River Basin to Jordan, 36 per cent to Israel, and 9 per cent each to the Syrian Arab Republic and Lebanon, and was never signed by the countries involved, since the Arab riparian states insisted that the United States government was not an impartial third party, but it has served as a general guideline for appropriations within the basin.

In 1964, the NWC opened and began diverting water from the Jordan River valley. This diversion led to the Arab Summit of 1964 where a plan was devised to begin diverting the headwaters of the Jordan River to the Syrian Arab Republic and Jordan. From 1965 to 1967 Israel attacked these construction projects in the Syrian Arab Republic, and along with other factors this conflict escalated into the Six Day War in 1967 when Israel completely destroyed the Syrian diversion project and took control of the Golan Heights, the West Bank, and the Gaza Strip. This gave Israel control of the Jordan River's headwaters and significant groundwater resources. The most recent directly water-related conflict occurred in 1969 when Israel attacked Jordan's East Ghor Canal due to suspicions that Jordan was diverting excess amounts of water (Green Cross Italy, 2006). Later on, Israel and Jordan acquiesced to the apportionment contained in the non-ratified 1955 Johnston Plan for sharing the Jordan Basin's waters (Milich and Varady, 1998). In 1978, Israel invaded Lebanon, giving Israel temporary control of the Wazzani springs that feed the Jordan River. The Golan Heights have been under Israeli law, jurisdiction, and administration since 1981, which however has not been recognized by the United Nations Security Council.

In 1994, the Jordanian-Israeli Peace Treaty included agreed upon articles on water. According to these articles, Jordan is entitled to store 20 million m3 of the Upper Jordan winter flow on the Israeli side (in Lake Tiberias) and get it back during the summer months. Jordan is entitled to get 10 million m3 of desalinated water from the saline Israeli springs near Tiberias and until the desalination plant is erected Jordan can get this quantity in summer from Lake Tiberias. Jordan can build a regulating/storage dam on the Yarmouk downstream of the diversion point of Yarmouk water to the KAC. Jordan can also build a dam of 20 million m3 capacity on the Jordan River and on its reach south of Lake Tiberias on the border between Jordan and Israel. Later, Jordan and Israel agreed to provide Jordan with 50 million m3 of desalinated water from the Israeli saline springs south of Lake Tiberias, and until the desalination plant is erected, Israel is providing Jordan with 25 million m3 from Lake Tiberias through the summer months. The regulating dam on the Yarmouk River was built and the water conveyor to transport water from Lake Tiberias in Israel to the KAC in Jordan was constructed just after the signing of the Peace Treaty.

The matter of water rights is one of the most difficult to negotiate, however a significant compromise was achieved between the two sides: Israel recognized Palestinian water rights (during the interim period a quantity of 70-80 million m3 should be made available to the Palestinians), and a Joint Water Committee was established to cooperatively manage West Bank water and to develop new supplies. This Committee also supervises joint patrols to investigate illegal water withdrawals. No territory whatsoever was identified as being necessary for Israeli annexation due to access to water resources (Wolf, 1996). In 2003, the Roadmap for Peace, developed by the United States, in cooperation with Russia, the European Union, and the United Nations (the Quartet), was presented to Israel and the Palestinian Authority, with the purpose of a final and comprehensive settlement of the Israel-Palestinian conflict.

In 1999, and due to drought, Israel decided to reduce the quantity of water piped to Jordan by 60 per cent which led to a sharp response from Jordan. Disputes of this kind are not unexpected in the future; however, the peace agreements have had the benefit of restricting such conflicts to political rather than military solutions. The fact that the joint water commission for Israel and the Palestinian Authority has continued to meet to discuss critical issues even during the current period of hostilities illustrates the progress that has already been made (Green Cross Italy, 2006).

In 2002, the water resources of the Hasbani basin became a source of mounting tension between

Lebanon and Israel, when Lebanon announced the construction of a new pumping station at the Wazzani springs. The springs feed the Hasbani River, which rises in the south of Lebanon and crosses the frontier to feed the Jordan and subsequently the Sea of Galilee, which is used as Israel's main reservoir. The pumping station was completed in October 2002. Its purpose was to provide drinking water and irrigation to some 60 villages on the Lebanese side of the Blue Line. October 2002 also marked the high point of tension between Israel and Lebanon, with a real risk of armed conflict over the station. The Israelis complained about the lack of prior consultation whereas the Lebanese contended that the project was consistent with the 1955 Johnston Plan on the water resources of the region. The EU and USA both sent envoys to the region in late 2002 in response to the rising tensions (EU, 2004).

In 2008, negotiations between Israel and the Syrian Arab Republic took place with the objective of solving the Golan Heights conflict.

4. SOURCES

Aquastat - FAO. (2008). Available at: http://www.fao.org/nr/water/aquastat/main/index.stm [accessed 28 February 2012]

CBS. (2006). Statistical abstract of Israel.

EU. (2004). EU Rapid Mechanism-End of programme report. Lebanon/Israel Wazzani springs dispute. European Commission Conflict Prevention and Crisis Management Unit

Green Cross Italy. (2006). Water for Peace. The Jordan River Basin. Available at http://www.greencrossitalia.it/ita/acqua/wfp/jordan_wfp_001.htm [accessed February 28 2012]

Israel Ministry of Foreign Affairs, (2008). Available at http://www.mfa.gov.il [accessed February 28 2012]

MAE (Ministère des Affaires Etrangères, France). (2005). L'Eau en Israël.

MARD (Ministry of Agriculture and Rural Development). (2006). Israel's agriculture at a glance. The Israel Export & International Cooperation Institute.

Milich, L and Varady, G. (1998). Openness, sustainability, and public participation in transboundary river-basin institutions. The Israel-Jordan Joint Water Committee (IJJWC).

MILT (Ministry of Industry, Trade and Labour). (2008). Quenching the world's thirst for more water.

MOE (Ministry of the Environment). (2004). Future of the Dead Sea.

MOE. (2005a). Environmental topics: Wastewater.

MOE. (2005b). The right of nature to water in Israel.

Wangnick Consulting. (2002). IDA Worldwide desalting plants inventory. Report No. 17. Sponsored by the International Desalination Association (IDA).

Wolf, A. (1996). "Hydrostrategic" Territory in the Jordan Basin: Water, War, and Arab-Israeli Peace Negotiations.

World Bank. (1999). Water challenge and institutional response: A cross-country perspective. Policy Research Working Paper 2045.

World Bank. (2007). Climate change, irrigation, and Israeli agriculture: Will warming be harmful? Policy Research Working Paper 4135.