Water Risk Filter

Country Overview - Kyrgyzstan

Water Indicators

Indicator	Value	Description	Source
Overall Basin Risk (score)	2.57	Overall Basin Risk (score)	
Overall Basin Risk (rank)	115	Overall Basin Risk (rank)	
Physical risk (score)	2.61	Physical risk (score)	
Physical risk (rank)	97	Physical risk (rank)	
Regulatory risk (score)	3.07	Regulatory risk (score)	
Regulatory risk (rank)	58	Regulatory risk (rank)	
Reputation risk (score)	1.97	Reputation risk (score)	
Reputation risk (rank)	187	Reputation risk (rank)	
1. Quantity - Scarcity (score)	2.63	1. Quantity - Scarcity (score)	
1. Quantity - Scarcity (rank)	60	1. Quantity - Scarcity (rank)	
2. Quantity - Flooding (score)	2.22	2. Quantity - Flooding (score)	
2. Quantity - Flooding (rank)	152	2. Quantity - Flooding (rank)	
3. Quality (score)	3.09	3. Quality (score)	
3. Quality (rank)	88	3. Quality (rank)	
4. Ecosystem Service Status (score)	2.51	4. Ecosystem Service Status (score)	
4. Ecosystem Service Status (rank)	92	4. Ecosystem Service Status (rank)	
5. Enabling Environment (Policy & Laws) (score)	3.00	5. Enabling Environment (Policy & Laws) (score)	
5. Enabling Environment (Policy & Laws) (rank)	80	5. Enabling Environment (Policy & Laws) (rank)	
6. Institutions and Governance (score)	3.75	6. Institutions and Governance (score)	
6. Institutions and Governance (rank)	42	6. Institutions and Governance (rank)	
7. Management Instruments (score)	2.90	7. Management Instruments (score)	
7. Management Instruments (rank)	89	7. Management Instruments (rank)	
8 - Infrastructure & Finance (score)	2.10	8 - Infrastructure & Finance (score)	
8 - Infrastructure & Finance (rank)	98	8 - Infrastructure & Finance (rank)	
9. Cultural Diversity (score)	1.00	9. Cultural importance (score)	
9. Cultural Diversity (rank)	167	9. Cultural importance (rank)	
10. Biodiversity Importance (score)	2.61	10. Biodiversity importance (score)	

Indicator	Value	Description	Source
10. Biodiversity Importance (rank)	158	10. Biodiversity importance (rank)	
11. Media Scrutiny (score)	2.10	11. Media Scrutiny (score)	
11. Media Scrutiny (rank)	165	11. Media Scrutiny (rank)	
12. Conflict (score)	2.07	12. Conflict (score)	
12. Conflict (rank)	139	12. Conflict (rank)	
1.0 - Aridity (score)	2.16	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)	55	The aridity risk indicator is based on the Global Aridity Index (Global-Aridity) and Global Potential Evapo-Transpiration (Global-PET) Geospatial data sets by Trabucco and Zomer (2009). These data sets provide information about the potential availability of water in regions with low water demand, thus they are used in the Water Risk Filter 5.0 to better account for deserts and other arid areas in the risk assessment.	Trabucco, A., & Zomer, R. J. (2009). Global potential evapo-transpiration (Global-PET) and global aridity index (Global-Aridity) geo-database. CGIAR consortium for spatial information.
1.1 - Water Depletion (score)	2.73	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)	65	The water depletion risk indicator is based on annual average monthly net water depletion from Brauman et al. (2016). Their analysis is based on model outputs from the newest version of the integrated water resources model WaterGAP3 which measures water depletion as the ratio of water consumption-to-availability.	Brauman, K. A., Richter, B. D., Postel, S., Malsy, M., & Flörke, M. (2016). Water depletion: An improved metric for incorporating seasonal and dry-year water scarcity into water risk assessments. Elem Sci Anth, 4.
1.2 - Baseline Water Stress (score)	3.32	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)	46	World Resources Institute's Baseline Water Stress measures the ratio of total annual water withdrawals to total available annual renewable supply, accounting for upstream consumptive use. A higher percentage indicates more competition among users.	Hofste, R., Kuzma, S., Walker, S., ... & Sutanudjaja, E.H. (2019). Aqueduct 3.0: Updated decision relevant global water risk indicators. Technical note. Washington, DC: World Resources Institute.
1.3 - Blue Water Scarcity (score)	2.24	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)	107	The blue water scarcity risk indicator is based on Mekonnen and Hoekstra (2016) global assessment of blue water scarcity on a monthly basis and at high spatial resolution (grid cells of 30 × 30 arc min resolution). Blue water scarcity is calculated as the ratio of the blue water footprint in a grid cell to the total blue water availability in the cell. The time period analyzed in this study ranges from 1996 to 2005.	Mekonnen, M. M., & Hoekstra, A. Y. (2016). Four billion people facing severe water scarcity. Science advances, 2(2), e1500323.
1.4 - Projected Change in Water Discharge (by ~2050) (score)	2.21	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)	65	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)	2.54	This risk indicator is based on the Standardized Precipitation and Evaporation Index (SPEI). Vicente-Serrano et al. (2010) developed this multi-scalar drought index applying both precipitation and temperature data to detect, monitor and analyze different drought types and impacts in the context of global warming. The mathematical calculations used for SPEI are similar to the Standard Precipitation Index (SPI), but it has the advantage to include the role of evapotranspiration.	Vicente-Serrano, S. M., Beguería, S., & López-Moreno, J. I. (2010). A multiscalar drought index sensitive to global warming: the standardized precipitation evapotranspiration index. Journal of climate, 23(7), 1696-1718.
1.5 - Drought Frequency Probability (rank)	92	This risk indicator is based on the Standardized Precipitation and Evaporation Index (SPEI). Vicente-Serrano et al. (2010) developed this multi-scalar drought index applying both precipitation and temperature data to detect, monitor and analyze different drought types and impacts in the context of global warming. The mathematical calculations used for SPEI are similar to the Standard Precipitation Index (SPI), but it has the advantage to include the role of evapotranspiration.	Vicente-Serrano, S. M., Beguería, S., & López-Moreno, J. I. (2010). A multiscalar drought index sensitive to global warming: the standardized precipitation evapotranspiration index. Journal of climate, 23(7), 1696-1718.
1.6 - Projected Change in Drought Occurrence (by ~2050) (score)	2.71	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)	183	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)	2.23	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)	152	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)	2.02	This risk indicator is based on multi-model simulation that applies both global climate and drought models from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP). 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)	120	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)	3.09	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)	88	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)	69	This risk indicator is based on the data set by Grill et al. (2019) mapping the world's free-flowing rivers. Grill et al. (2019) compiled a geometric network of the global river system and associated attributes, such as hydro-geometric properties, as well as pressure indicators to calculate an integrated connectivity status index (CSI). While only rivers with high levels of connectivity in their entire length are classified as free-flowing, rivers of CSI < 95% are considered as fragmented at a certain degree.	Grill, G., Lehner, B., Thieme, M., Geenen, B., Tickner, D., Antonelli, F., ... & Macedo, H. E. (2019). Mapping the world's free-flowing rivers. Nature, 569(7755), 215.
4.2 - Catchment Ecosystem Services Degradation Level (tree cover loss) (score)	1.00	For this risk indicator, tree cover loss was applied as a proxy to represent catchment ecosystem services degradation since forests play an important role in terms of water regulation, supply and pollution control. The forest cover data is based on Hansen et al.'s global Landsat data at a 30-meter spatial resolution to characterize forest cover and change. The authors defined trees as vegetation taller than 5 meters in height, and forest cover loss as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000 – 2018.	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A. A., Tyukavina, A., ... & Kommareddy, A. (2013). High-resolution global maps of 21st-century forest cover change. science, 342(6160), 850-853.

Indicator	Value	Description	Source
4.2 - Catchment Ecosystem Services Degradation Level (tree cover loss) (rank)	180	For this risk indicator, tree cover loss was applied as a proxy to represent catchment ecosystem services degradation since forests play an important role in terms of water regulation, supply and pollution control. The forest cover data is based on Hansen et al.'s global Landsat data at a 30-meter spatial resolution to characterize forest cover and change. The authors defined trees as vegetation taller than 5 meters in height, and forest cover loss as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000 – 2018.	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A. A., Tyukavina, A., ... & Kommareddy, A. (2013). High-resolution global maps of 21st-century forest cover change. science, 342(6160), 850-853.
4.3 - Projected Impacts on Freshwater Biodiversity (score)	3.18	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)	61	The study by Tedesco et al. (2013) to project changes [% increase or decrease] in extinction rate by ~2090 of freshwater fish due to water availability loss from climate change is used as a proxy to estimate the projected impacts on freshwater biodiversity.	Tedesco, P. A., Oberdorff, T., Cornu, J. F., Beauchard, O., Brosse, S., Dürr, H. H., ... & Hugueny, B. (2013). A scenario for impacts of water availability loss due to climate change on riverine fish extinction rates. Journal of Applied Ecology, 50(5), 1105-1115.
5.1 - Freshwater Policy Status (SDG 6.5.1) (score)	3.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National Water Resources Policy" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
5.1 - Freshwater Policy Status (SDG 6.5.1) (rank)	72	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National Water Resources Policy" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
5.2 - Freshwater Law Status (SDG 6.5.1) (score)	3.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National Water Resources Law(s)" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.

Indicator	Value	Description	Source
5.2 - Freshwater Law Status (SDG 6.5.1) (rank)	83	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National Water Resources Law(s)" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
5.3 - Implementation Status of Water Management Plans (SDG 6.5.1) (score)	3.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National IWRM plans" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
5.3 - Implementation Status of Water Management Plans (SDG 6.5.1) (rank)	90	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "National IWRM plans" indicator, which corresponds to one of the three national level indicators under the Enabling Environment category. For SDG 6.5.1, enabling environment depicts the conditions that help to support the implementation of IWRM, which includes legal and strategic planning tools for IWRM.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
6.1 - Corruption Perceptions Index (score)	4.00	This risk Indicator is based on the latest Transparency International's data: the Corruption Perceptions Index 2018. This index aggregates data from a number of different sources that provide perceptions of business people and country experts on the level of corruption in the public sector.	Transparency International (2019). Corruption Perceptions Index 2018. Berlin: Transparency International.
6.1 - Corruption Perceptions Index (rank)	73	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)	4.00	This risk indicator is based on Freedom House (2019), an annual global report on political rights and civil liberties, composed of numerical ratings and descriptive texts for each country and a select group of territories. The 2019 edition involved more than 100 analysts and more than 30 advisers with global, regional, and issue-based expertise to covers developments in 195 countries and 14 territories from January 1, 2018, through December 31, 2018.	Freedom House (2019). Freedom in the world 2019. Washington, DC: Freedom House.

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Indicator	Value	Description	Source
6.2 - Freedom in the World Index (rank)	57	This risk indicator is based on Freedom House (2019), an annual global report on political rights and civil liberties, composed of numerical ratings and descriptive texts for each country and a select group of territories. The 2019 edition involved more than 100 analysts and more than 30 advisers with global, regional, and issue-based expertise to covers developments in 195 countries and 14 territories from January 1, 2018, through December 31, 2018.	Freedom House (2019). Freedom in the world 2019. Washington, DC: Freedom House.
6.3 - Business Participation in Water Management (SDG 6.5.1) (score)	3.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "Business Participation in Water Resources Development, Management and Use" indicator, which corresponds to one of the six national level indicators under the Institutions and Participation category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
6.3 - Business Participation in Water Management (SDG 6.5.1) (rank)	83	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "Business Participation in Water Resources Development, Management and Use" indicator, which corresponds to one of the six national level indicators under the Institutions and Participation category.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
7.1 - Management Instruments for Water Management (SDG 6.5.1) (score)	3.00	This risk indicator is based on SDG 6.5.1. Degree of IWRM Implementation "Sustainable and efficient water use management" indicator, which corresponds to one of the five national level indicators under the Management Instruments category. For SDG 6.5.1, management instruments refer to the tools and activities that enable decision-makers and users to make rational and informed choices between alternative actions.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
7.1 - Management Instruments for Water Management (SDG 6.5.1) (rank)	82	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)	95	This risk indicator is based on the data set by UN IGRAC (2019) to determine the level of availability of groundwater monitoring data at country level as groundwater management decisions rely strongly on data availability. The level of groundwater monitoring data availability for groundwater management is determined according to a combination of three criteria developed by WWF and IGRAC: 1) Status of country groundwater monitoring programme, 2) groundwater data availability for NGOs and 3) Public access to processed groundwater monitoring data.	UN IGRAC (2019). Global Groundwater Monitoring Network GGMN Portal. UN International Groundwater Resources Assessment Centre (IGRAC).
7.3 - Density of Runoff Monitoring Stations (score)	2.36	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)	154	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)	3.00	This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.	WHO & UNICEF (2019). Estimates on the use of water, sanitation and hygiene by country (2000-2017). Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.
8.1 - Access to Safe Drinking Water (rank)	61	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.

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Indicator	Value	Description	Source
8.2 - Access to Sanitation (rank)	155	This risk indicator is based on the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (UNICEF/WHO) 2019 data. It provides estimates on the use of water, sanitation and hygiene by country for the period 2000-2017.	WHO & UNICEF (2019). Estimates on the use of water, sanitation and hygiene by country (2000-2017). Joint Monitoring Programme for Water Supply, Sanitation and Hygiene.
8.3 - Financing for Water Resource Development and Management (SDG 6.5.1) (score)	3.00	This risk indicator is based on the average 'Financing' score of UN SDG 6.5.1. Degree of IWRM Implementation database. UN SDG 6.5.1 database contains a category on financing which assesses different aspects related to budgeting and financing made available and used for water resources development and management from various sources.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
8.3 - Financing for Water Resource Development and Management (SDG 6.5.1) (rank)	116	This risk indicator is based on the average 'Financing' score of UN SDG 6.5.1. Degree of IWRM Implementation database. UN SDG 6.5.1 database contains a category on financing which assesses different aspects related to budgeting and financing made available and used for water resources development and management from various sources.	UN Environment (2018). Progress on integrated water resources management. Global baseline for SDG 6 Indicator 6.5.1: degree of IWRM implementation.
9.1 - Cultural Diversity (score)	1.00	Water is a social and cultural good. The cultural diversity risk indicator was included in order to acknowledge that businesses face reputational risk due to the importance of freshwater for indigenous and traditional people in their daily life, religion and culture. This risk indicator is based on Oviedo and Larsen (2000) data set, which mapped the world's ethnolinguistic groups onto the WWF map of the world's ecoregions. This cross-mapping showed for the very first time the significant overlap that exists between the global geographic distribution of biodiversity and that of linguistic diversity.	Oviedo, G., Maffi, L., & Larsen, P. B. (2000). Indigenous and traditional peoples of the world and ecoregion conservation: An integrated approach to conserving the world's biological and cultural diversity. Gland: WWF (World Wide Fund for Nature) International.
9.1 - Cultural Diversity (rank)	167	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)	3.47	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)	111	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)	1.75	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)	173	The underlying data set for this risk indicator comes from the Freshwater Ecoregions of the World (FEOW) 2015 data developed by WWF and TNC. Count of fish species is used as a representation of freshwater biodiversity richness. Companies operating in basins with higher number of fish species are exposed to higher reputational risks.	WWF & TNC (2015). Freshwater Ecoregions of the World.
11.1 - National Media Coverage (score)	3.00	This risk indicator is based on joint qualitative research by WWF and Tecnoma (Typsa Group). It indicates how aware local residents typically are of water-related issues due to national media coverage. The status of the river basin (e.g., scarcity and pollution) is taken into account, as well as the importance of water for livelihoods (e.g., food and shelter).	WWF & Tecnoma (TYPSA Group)
11.1 - National Media Coverage (rank)	129	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)	171	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)

Water Risk Filter

Country Overview - Kyrgyzstan

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)	136	This risk indicator is based on 2018 data collected by RepRisk on counts and registers of documented negative incidents, criticism and controversies that can affect a company's reputational risk. These negative news events are labelled per country and industry class.	RepRisk & WWF (2019). Due diligence database on ESG and business conduct risks. RepRisk.
12.2 - Hydro-political Risk (score)	2.13	This risk indicator is based on the assessment of hydro-political risk by Farinosi et al. (2018). More specifically, it is based on the results of spatial modelling by Farinosi et al. (2018) that determined the main parameters affecting water cross-border conflicts and calculated the likelihood of hydro-political issues.	Farinosi, F., Giupponi, C., Reynaud, A., Ceccherini, G., Carmona-Moreno, C., De Roo, A., ... & Bidoglio, G. (2018). An innovative approach to the assessment of hydro-political risk: A spatially explicit, data driven indicator of hydro-political issues. Global environmental change, 52, 286-313.
12.2 - Hydro-political Risk (rank)	109	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 (#)	6082700	Population, total	The World Bank 2018, Data , hompage accessed 20/04/2018
GDP (current US$)	6551287938	GDP (current US$)	The World Bank 2018, Data , hompage accessed 20/04/2018
EPI 2018 score (0-100)	54.86	Environmental Performance Index	
WGI -Voice and Accountability (0-100)	0.00	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)	0.00	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)	0.00	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)	0.00	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)	0.00	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)	0.00	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
WRI BWS all industries (0-5)	4.82	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)	22	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)	11	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)	10	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)	11	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 - Kyrgyzstan

Indicator	Value	Description	Source
Baseline Water Stress (BWS) - 2030 BAU (increasing rank describes lower risk)	11	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)	11	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)	11	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)	12	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)	12	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)	12	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 - Kyrgyzstan

Indicator	Value	Description	Source
Total water footprint of national consumption (m3/a/cap)	1499.44	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 (%)	43.69	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)	1023.00	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)	1023.00	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 (%)	99.80	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)	91.26	World Development Indicators	The World Bank 2018, Data , hompage accessed 20/04/2018
Total internal renewable water resources (IRWR) (10^9 m3/year)	48.93	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)	-25.31	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)	48.93	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13

Country Overview - Kyrgyzstan

Indicator	Value	Description	Source
Total renewable water resources (10^9 m3/year)	23.62	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
Dependency ratio (%)	1.13	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)	3976.00	Aquastat - Water Ressources	FAO. 2016. AQUASTAT website. Food and Agriculture Organization of the United Nations (FAO). Website accessed on 2018/04/13
World happiness [0-8]	5.13	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 country can be divided into two hydrological zones: the flow generation zone (mountains), covering 171,800km2, or 87 per cent of the territory; and the flow dissipation zone of 26,700km2, which is 13 per cent of the territory. Most of the rivers are fed by glaciers and/or snow melt. Peak flows occur from April to July, with 80-90 per cent of the flow in the period of about 120-180 days extending to August or September.

There are six main river basin groups in the country. No rivers flow into Kyrgyzstan.

The river basins are, from the largest to the smallest:

-The Syr Darya River basin. Called the Naryn River before it reaches the Fergana valley, the Syr Darya flows to Tajikistan and Uzbekistan. In Uzbekistan, the Syr Darya receives the Chatkal, a tributary which rises in Kyrgyzstan.

-The Chu, Talas and Assa river basin. All three rivers flow to Kazakhstan, where the part not withdrawn is lost in the desert.

-The south-eastern river basins. These consist of small catchment areas draining to China. The main rivers are the Aksay, Sary Dzhaz and Kek Suu, and are situated at high elevations.

-The Lake Issyk-Kul interior basin. The lake is low-saline and it is estimated that all the flow which is not evaporated is used for irrigation or domestic purposes.

-The Amu Darya River basin. The Amu Darya rises mainly in Tajikistan, but receives the contribution of a Kyrgyz tributary, the Kyzyl Suu, in the southwest of the country.

-The Lake Balkhash basin. It consists of the small catchment of the Ili River, which rises in Kyrgyzstan and flows to this Kazakh lake.

The average natural surface water flow is estimated at 44.05km3/year, all internally produced. The FSU allocated about 25 per cent of these water resources to Kyrgyzstan, with the rest going to the neighbouring republics of Kazakhstan, Uzbekistan and Tajikistan. This rule did not concern the resources generated in the south-eastern basins, since they flow towards China, and the very limited resources generated in the Lake Balkhash basin. This allocation has been re-endorsed by the five states of Central Asia, until a new water strategy for the Aral Sea basin, which is being prepared by the Interstate Commission for Water Coordination, proposes another sharing. The surface water resources allocated to Kyrgyzstan are calculated every year, depending on the existing flows. However, on average, it can be considered that they represent a volume of 11.64km3/year. In addition, the 6.18km³/year of the south-eastern basin and the 0.36km³/year of the Lake Balkhash basin are available for use, giving a total of 18.18km³/year of ARSWR.

The annual renewable groundwater resources have been estimated at 13.6km3/year, of which about 11.2km3/year is common to surface water resources. The groundwater resources for which abstraction equipment exists (1991) have been estimated at 3.39km3/year, mainly in the Chu River basin (2.02km³/year or 60 per cent of the total), the Syr Darya River basin (0.73km3/year or 22 per cent) and the Issyk-Kul depression (0.52km³/year or 15 per cent).

The total number of natural lakes in Kyrgyzstan is 1,923, with a total surface area of 6,800km2. The largest lake is Lake Issyk-Kul with a total area of 6,236km2.

Due to the glacier and snow origin of most of the rivers, low and unreliable flows are often the rule in the months of August and September, which correspond to the latter part of the growing season. Regulation of these flows is thus needed to ensure that adequate water supplies are available over the whole cropping period.

In 1995, the total capacity of reservoirs was estimated at 23.5km3. There were 18 reservoirs: 6 in the Chu River basin, with a total capacity of 0.6km3; 3 in the Talas River basin, with a total capacity of 0.6km3; and 9 in the Syr Darya River basin, with a total capacity of 22.3km3. The Toktogul dam, with a reservoir capacity of 19.5km3, is situated on the Naryn River, a northern tributary of the Syr Darya. It is a multipurpose dam for irrigation, hydropower production and flood protection/regulation. However, due to its location near the border with Uzbekistan, it does not play an important role in the irrigation of areas within Kyrgyzstan. The same applies to the Kirov dam, which has a capacity of 0.55km3 and is located on the Talas River near the border with Kazakhstan.

According to Mamatov et al (2004), annual average volume water of total water resources makes up 2,458km3 including 50km3 of surface river runoff, 13km3 of potential reserves of ground water, 1,745km3 of lake water, and 650km3 of glaciers.

In total, there are 8,208 glaciers of different sizes on the territory of Kyrgyzstan. The area of ice is 8,169.4km2, or 4.2 per cent of the republic's territory. The main glacier centres are located in the extreme east, in the basin of the river Sary-Jaz where the largest plain glaciers are located and in the south of the Zailiy ridge.The supply of fresh water preserved in the mountain glaciers is 650 billion m3, which exceeds 12 times the rivers' flow resources in the country. The trend to climate warming leads to stable intensive reduction of glacier surfaces. According to forecasts, by 2025 the territories of glaciers will be reduced by 30-40 per cent resulting in water volume diminishing by 25-35 per cent (Mamatov et al, 2004).

There is a significant amount of lakes and other natural reservoirs with a common area of about 6,697km2 and with a common annual volume of water about 1,745 billion m3 on the territory of the republic. It is necessary to note that 84 per cent of lakes are located at heights of 3000-4000m in regions of tectonic origin. Potential annual stock of ground water is 13 billion m3, with ice holding about 650 billion m3 (Mamatov et al, 2004).

The longest river is the Narin at 535km, the Chatkar is 205km long and the Chu is 221km long,

annual flow is 5.83km3. The river Talas and the river Assaa have a 2km3 flow per year. More than 3,500 rivers flowing on the territory of the republic supply water to the neighbouring states: Kazakhstan, Uzbekistan, Tajikistan, and also the Sinjan-Uigur autonomous region of China (Mamatov et al, 2004).
The bogs in the republic are 0.5 per cent of the territory in the places where ground water is near the surface (Issyk-Kul lake, Son-Kul lake, River Chui valley, Talas, Narin) (Mamatov et al, 2004).
There are 13 artificial reservoirs with a total area of 378.2km3 and volume of water of 23.41km3 in Kyrgyzstan (Mamatov et al, 2004).
About 75 per cent of the river runoff goes out from the republic to Uzbekistan, Kazakhstan, and the Sintzyan-Uigur region of China. More than 10 large reservoirs for irrigation were built to regulate runoff of the transnational rivers Chui, Talas, Naryn, Ak-Bura, and Kara-Darya. Damage from agricultural yield shortage on the territories occupied by reservoirs is estimated at $11.3 million (Mamatov et al, 2004).

1.1.2. WATER USE

In 1994, the total water withdrawal was estimated at 10.1km3, including the re-use of drainage waters. The total water withdrawal increased progressively from 1970 to 1990. The average annual surface water availability for irrigation in the period 1985-1992 was about 10.77km3, although the water requirement had been evaluated at 10.83km3, leading to an overall irrigation water deficit for the country of 0.06km3. In some basins (Syr Darya, Chu, Talas) there was a fairly severe water shortage, while in other basins (Amu Darya, Issyk-Kul, south-eastern) there was a surplus.
In 1994, more than 0.6km3 of water was withdrawn from groundwater. Other water needs, mainly for fisheries, were estimated at 9 million m3/year in 1994. A prospective analysis shows that in 2010 the water demand might be 13.07km3/year, which exceeds the current allocation.
The gross theoretical hydropower potential in Kyrgyzstan was estimated in 1985 at about 162,500Gwh/year, and the economically feasible potential is estimated at about 55,000GWh/year. The hydropower installed capacity is estimated at about 3GW, a number of hydropower plants being part of the Naryn-Syr Darya cascade, controlled by the Toktogul dam. Hydropower plays a key role in Kyrgyzstan and is the country's main source of energy (about 90 per cent of electricity generation in 1995), given its limited gas, oil and coal resources. However, hydropower production releases water mainly in winter, while the downstream countries would need water for the summer cropping season. At regional level, competition between irrigation and hydropower appears to be a major issue. An agreement was reached with Uzbekistan and Kazakhstan in 1996. These two countries will transfer energy, coal or gas to Kyrgyzstan in periods of power deficit, to compensate for the non-use of water for hydropower in the winter period.
According to Mamatov et al (2004), on the basis of the Intergovernmental Agreement of the countries of Central Asia, the republic may use 24 per cent of volume of a river source from an annual source of 50 billion m3 (i.e. 12 billion m3). A significant part (about 23 per cent) of return water is lost during its use. The reasons for the unsatisfactory technical condition of irrigation and water-distributive systems are wear of equipment, application of imperfect methods for watering, and an absence of water-saving technologies. In recent years, the stable tendency of growth of unproductive losses of water is marked, and 90 per cent of them are losses in irrigation (Mamatov et al, 2004).
Water in the republic is used for household, industrial and agricultural use. The consumption of water for agricultural irrigation is 88 per cent of total use (about 12 per cent of water is for household and industrial consumption) (Mamatov et al, 2004).

1.2. WATER QUALITY, ECOSYSTEMS AND HUMAN HEALTH

The main environmental problems in the country are related to water pollution, due to the poor quality of the existing plants for wastewater treatment; the absence of treatment for saline return flow from agricultural land; and possible contamination from the radioactive refuse inherited from the Soviet period.
Other environmental problems are related to the observed reduction of glaciers, which might lead to a reduction in flow; to soil erosion and the resulting siltation of reservoirs, which limit the possibility of flow regulation; and to the increase of soil salinity, which might become a constraint on farming.
According to the Ministry of Environmental Protection, the mining sector is considered to be the main source of air and water pollution in Kyrgyzstan. As of 1995, 30km2 of land were directly damaged by mining activities. Tailings dumps containing nearly 100 million m^3 of waste (2 million m^3 of which is radioactive) are located in areas prone to earthquakes and landslides. As noted by CEE Bankwatch Network in Mountains of Gold, "Most Kyrgyz mines during their lifecycle neglect the particularities of the mountains' ecosystems...Such carelessness of mining practices very often leads to unprecedented environmental and social outcomes." (Earthworks, 2008).
According to Nations Encyclopedia, among Kyrgyzstan's most significant environmental issues are water pollution and soil salinity resulting from improper irrigation methods. The pollution of the nation's water causes health problems for 25 per cent of its people, many of whom draw water directly from contaminated wells and streams. Only 66 per cent of the nation's rural dwellers have a publicly regulated water supply.

2. GOVERNANCE ASPECTS

2.1. WATER INSTITUTIONS

The Ministry of Agriculture and Water Resources (formerly there were two separate ministries) is in charge of water resources research, planning, development and distribution, and undertakes the construction, operation and maintenance of the irrigation and drainage networks at the inter-farm level of the country. Water allocations are regularly reduced in order to promote savings and to satisfy the demand from new users. In the case of the Syr Darya River basin, one of the objectives is also to increase the flow to the Aral Sea.
In the past, irrigation systems were designed and operated to deliver water to the large sovkhoz and kolkhoz and it was a relatively easy task for the Ministry of Water Resources to deliver water to

each farm. However, with the increasing number of small farms that has resulted from the privatization programme, there is a need for institutions which provide technical support to farmers, and which are in an intermediate position between the Ministry of Agriculture and Water Resources and the farmers.

Article 18 of the new water law (14 January 1994) includes specific provisions for the establishment of Water Users Associations (WUAs) which would receive water from the Ministry of Agriculture and Water Resources and allocate it among their members. They would have legal status, be independent of the government, be able to collect taxes from their members, borrow funds, and take appropriate action to maintain and upgrade 'their' parts of the irrigation system, which are the on-farm systems formerly operated by the sovkhoz and kolkhoz.

The Ministry of Municipal Affairs is responsible for domestic water supply and wastewater treatment.

Monitoring of surface water quantity and quality is carried out by the Kyrgyz Hydrometeorological Agency, while the systematic exploration, investigation and monitoring of groundwater is carried out by the State Committee for Geology and Hydrogeological Expedition.

At international level, Kyrgyzstan is a member of the Syr Darya River BWO, ICWC and IFAS.

2.2. WATER MANAGEMENT

Kyrgyzstan is endowed with sufficient quantities of water of excellent quality for domestic and industrial use for the foreseeable future. Due to commitments towards downstream countries, water availability is likely to become a constraint on expanding irrigation, extending land reclamation, and improving productivity of irrigated areas, unless there are significant improvements in efficiency, and a major effort made to increase water conservation.

According to the agricultural sector review of the World Bank (1995), the following three key issues need immediate attention to secure the sustainability of irrigation in Kyrgyzstan:

-New institutional arrangements must be made at farm level to manage and maintain the distribution of water within the former sovkhoz and kolkhoz as farming units are privatized. For this, the need to create WUAs has been felt. The new water law already provides a framework for this, but the establishment of such WUAs will require further attention.

-The financing of the operation and maintenance (O&M) of the existing systems must be secured and obtained largely from water users. The new water law has a section devoted to water fees and taxes. There are charges for water use, for the service of providing water (collection, transport, distribution and purification) and for the discharge of polluting substances into water. There are also provisions for increased fees if water consumption rates exceed forecast levels. There are also fee exemptions for the use of water-saving technologies and other water conservation measures.

-Environmental degradation of the irrigation systems and the irrigated lands must be guarded against through increased efforts to improve drainage and to reduce salinity and soil erosion. For this, a programme to improve irrigation efficiency and reduce water applications, especially in the more elevated areas, is needed. The steep slopes of the irrigated lands in the mountain areas with shallow soils should enable conversion to sprinkler or micro-irrigation methods, especially where water under pressure can be provided.

Priorities and the Key Problems of Water Resources Management

According to UCC-Water (2006), there are some institutional problems, which will make the process of strategic plans' formulation and, especially, their implementation more complicated and less streamlined in some main river basins of Kyrgyzstan. These problems include:

1.Data Availability. Data series about water resources often have some gaps due mainly to financial difficulties. There is no regularity in the data collection and processing. As a consequence the reliable assessment of the available water resources is impossible. In particular, there is a lack of information about volumes of return and infiltration waters, which play a significant role in the water balance of river basins. Necessity of investment and lack of stable financing for restoration of the national water resources database and the basin water monitoring structures are the main constraints to the efficient planning of water resources management (UCC-Water, 2006).

2.Water Supply Guarantees. Only 22.5 per cent (or 262km2, including 154km2 irrigated from reservoirs) of irrigated lands in Kyrgyzstan are provided with a guaranteed water supply from the large rivers and reservoirs. The other 78 per cent – or more than 800km2 – of lands are irrigated from small unregulated rivers. Practically all water resources of these rivers are used for irrigation and during two months of peak irrigation water demands water supply deficiency here is 30-50 per cent. The most critical situation with the water supply for the rural population is observed in the populous regions of the Fergana valley. One of the consequences of the limited water supply to these regions is restriction of the potential for expansion of irrigation, as well as rural development and improvement of population living standards. Simultaneously at the sub-basin level it is necessary to undertake measures aimed at regulation of water supply and demand as well as the need for attraction of investments (UCC-Water, 2006).

3.Upper Watersheds. Protection and conservation of the forest- and snow-covered regions in the upper watersheds are the key measures for formation of water flow and its regulation; control over soil erosion and silting of water bodies; maintaining water quality; and prevention of floods, mudflows, droughts etc. (UCC-Water, 2006).

4.Conservation and Regeneration of Fish Resources. Kyrgyzstan possesses a capacity for fish production using large water bodies for the internal market and export of fish products and aquacultures. Planning of water use for fishery and ecological purposes should be integrated in order to eliminate problems associated with return water pollution in excess of MAC (maximum allowable concentration) (UCC-Water, 2006).

5.Water Use Planning in Conditions of Growing Uncertainty. Currently water is shared on the basis of the hydrological forecasts of water availability and water demands for irrigated agriculture and the other sectors of the economy. Due to deterioration and reduction of the hydro-meteorological data collection network preparation of reliable river flow forecasts becomes more and more difficult, especially in the conditions of uncertainty caused by climate change and the other associated unpredictable factors (UCC-Water, 2006).

6.Scarcity of Basins' Water Resources and unpredictability of their hydrograph are the main factors that impede introduction of the basin principle of management and planning (UCC-Water, 2006).

6.It is obvious that balance between water supply and demand at the basin level, as well as water quality, will become critical in the next 5 – 20 years. Availability of water resources and ecological situation differ by basins in accordance with the following brief assessment (UCC-Water, 2006):
•With growing ecological problems the situation in the Issyk Kul lake basin will become critical in 2010. Further water intake or disposal of wastes will lead to deterioration of the ecological situation in the lake basin;
•With the predicted rapid growth of water intake in the Chu river basin the water resources, including the important additional underground water reserves, will be completely depleted by 2020;
•Water resources of the Talas river basin will be completely used by 2008. With the limited reserves of suitable underground waters in this region it is possible to assume that in the coming years limitation and regulation of water use in this basin will be a priority;
•In the Alai valley of the Amudarya river basin due to low density of population and limited perspectives for water resources development, limitations on "water supply demand" balance are not envisaged for the next 20 – 30 years;
•There is no threat of water supply limitations in the upper part of the Naryn river basin. However, in the Osh, Batken and Djelal Abad oblasts with growth of population density, intensification of irrigated agriculture and the limited resources of the underground waters, as well as with ever-growing social and economic risks, water use is the most critical in the country. Therefore, there is an urgent need to undertake actions aimed at regulation and limitation of water use and improvement of water availability in order to solve the problem of development needs.
7.Possibilities and Limitations of Water Delivery Management. The following possibilities for increasing water availability are limited by the high costs and financial difficulties that may prove to be unrealistic in the current economic conditions (UCC-Water, 2006):
•Regulation of flow of the small rivers and sub-basins;
•Interbasin transfer of water resources (from the Tarim and Naryn rivers);
•Increasing development of the underground fresh water reserves;
•Development of the lift irrigation systems for lands along the large rivers;
•Reuse of return waters and wastewaters after primary treatment (with additional benefit for the environment and agricultural production).
7.Possibilities for the future increase of water intake volumes are not only limited by international water-sharing quotas. Around 78 per cent of the irrigated land area of Kyrgyzstan uses water from the natural (unregulated) small rivers. As of now all reserves for increase of water intake volumes from these rivers during the growing period are already depleted. Further expansion of land area irrigated by gravity systems, which withdraw water from the large rivers, has also extremely limited perspectives (UCC-Water, 2006).
8.Management and Planned Possibilities. In conditions of imminent quantitative crisis with water resources and frequent emergency situations associated with water, basin planning is the key mechanism for optimal water distribution, structural regulations and preventive measures, which are based on long-term planning (UCC-Water, 2006).
9.Other national planning priorities include (UCC-Water, 2006):
•Coordination of water use with progress in rehabilitation of irrigated lands;
•Transition from the seasonal operative planning of water resources use within the Naryn river basin's cascade of reservoirs to calculation of compensated energy supply on the basis of long-term integrated water-energy models;
•Management of pollution threats to surface and underground waters oriented on the future planning of water safety, including control over pollution from industry and use of fertilizers in agriculture, environment protection, modernization of irrigation and drainage systems, and prevention of natural disasters caused by human activities.
Actual Status of the IWRM Process in the Kyrgyz RepublicActual Status of the IWRM Process in the Kyrgyz Republic
According to UCC-Water (2006), the IWRM concept that emerged in response to the growing water problems in the world is vital for Kyrgyzstan as well. An understanding of the necessity for the relevant reforms in the republic's water sector led to the adoption in January 2005 of the main normative act, the Water Code of the Kyrgyz Republic. In accordance with the Water Code the State Water Administration (SWA) is entrusted with the leading role in water resources management. By the decree of the government of the Kyrgyz Republic the Department of Water Resources is appointed as an acting State Water Administration. The National Water Council also was established by the decree of the government along with approval of its provision and list of staff members (UCC-Water, 2006).According to UCC-Water (2006), the IWRM concept that emerged in response to the growing water problems in the world is vital for Kyrgyzstan as well. An understanding of the necessity for the relevant reforms in the republic's water sector led to the adoption in January 2005 of the main normative act, the Water Code of the Kyrgyz Republic. In accordance with the Water Code the State Water Administration (SWA) is entrusted with the leading role in water resources management. By the decree of the government of the Kyrgyz Republic the Department of Water Resources is appointed as an acting State Water Administration. The National Water Council also was established by the decree of the government along with approval of its provision and list of staff members (UCC-Water, 2006).
The majority of integrated water resources management principles are envisaged in the Water Code. Adoption of the Code, approved by the Parliament (Zhogorku Kenesh) and signed by the President of the Kyrgyz Republic has provided the legal basis for introduction of the IWRM principles on a nationwide level. Substantial assistance to this process will be provided by the on-going implementation of IWRM projects in the Fergana valley and Chu and Talas river basins. Concrete steps towards realization of the hydrographical management principle are establishment and operation within the DWR system of Interrayon Canal Administrations (in Chu and Talas oblasts, and within the framework of the IWRM-Fergana project), the Aravan-Akbura Canal Administration (in Osh oblast) and Water Committee of this canal that comprises representatives of water users. Currently this committee is reorganized into the Union of Water User Associations of the Aravan-Akbura canal. The experience of these pilot objects is planned to be rolled out into the other irrigation systems of the republic (UCC-Water, 2006).The majority of integrated water

resources management principles are envisaged in the Water Code. Adoption of the Code, approved by the Parliament (Zhogorku Kenesh) and signed by the President of the Kyrgyz Republic has provided the legal basis for introduction of the IWRM principles on a nationwide level. Substantial assistance to this process will be provided by the on-going implementation of IWRM projects in the Fergana valley and Chu and Talas river basins. Concrete steps towards realization of the hydrographical management principle are establishment and operation within the DWR system of Interrayon Canal Administrations (in Chu and Talas oblasts, and within the framework of the IWRM-Fergana project), the Aravan-Akbura Canal Administration (in Osh oblast) and Water Committee of this canal that comprises representatives of water users. Currently this committee is reorganized into the Union of Water User Associations of the Aravan-Akbura canal. The experience of these pilot objects is planned to be rolled out into the other irrigation systems of the republic (UCC-Water, 2006).

More precise definition of the directions and methods for reformation of water management based on the IWRM principles is also planned within the framework of the “Improvement of water resources management” project that will be commenced in the second half of 2006, with the World Bank sponsorship (UCC-Water, 2006).More precise definition of the directions and methods for reformation of water management based on the IWRM principles is also planned within the framework of the “Improvement of water resources management” project that will be commenced in the second half of 2006, with the World Bank sponsorship (UCC-Water, 2006).

The long-term strategy for development of WUAs had been developed within the framework of the On-farm Irrigation Project, as an important part of the IWRM principles development in the Kyrgyz Republic (UCC-Water, 2006).The long-term strategy for development of WUAs had been developed within the framework of the On-farm Irrigation Project, as an important part of the IWRM principles development in the Kyrgyz Republic (UCC-Water, 2006).

This strategy envisages the following (UCC-Water, 2006):This strategy envisages the following (UCC-Water, 2006):

•completion of the denationalization process of the water management bodies and formation of O&M enterprises with the various types of ownership: private and mixed;•completion of the denationalization process of the water management bodies and formation of O&M enterprises with the various types of ownership: private and mixed;

•completion of the WUA establishment process and their active participation in water infrastructure management and the protection of water fund;•completion of the WUA establishment process and their active participation in water infrastructure management and the protection of water fund;

•ultimate differentiation of functions and powers of the water relationship entities;•ultimate differentiation of functions and powers of the water relationship entities;

•participation of government bodies in the O&M activities financed from the state budget only on the strategically important water systems and structures. Economic entities and their associations will be completely responsible for management and O&M of the rest of the water infrastructure.•participation of government bodies in the O&M activities financed from the state budget only on the strategically important water systems and structures. Economic entities and their associations will be completely responsible for management and O&M of the rest of the water infrastructure.

For development of water relationships in market economy conditions the government consistently carries out measures aimed at (UCC-Water, 2006):For development of water relationships in market economy conditions the government consistently carries out measures aimed at (UCC-Water, 2006):

•adaptation of water users to market economy conditions;•adaptation of water users to market economy conditions;

•supporting water users through provision of credit and grants, technical and methodological assistance, education and advanced training, information support, assistance in organization of construction, repair and rehabilitation works, introduction of new technologies etc.;•supporting water users through provision of credit and grants, technical and methodological assistance, education and advanced training, information support, assistance in organization of construction, repair and rehabilitation works, introduction of new technologies etc.;

•protection of water user rights;•protection of water user rights;

•promotion of the establishment of WUAs;•promotion of the establishment of WUAs;

•reduction of water users’ economic risks in the agricultural sector through development of the insurance sector;•reduction of water users’ economic risks in the agricultural sector through development of the insurance sector;

•gradual transfer of the majority of water infrastructure fixed assets to water users or their associations with management and ownership rights.•gradual transfer of the majority of water infrastructure fixed assets to water users or their associations with management and ownership rights.

Activities of the WUAs are regulated by the current Law on Water User Associations and bylaws being developed in accordance with this law (UCC-Water, 2006).Activities of the WUAs are regulated by the current Law on Water User Associations and bylaws being developed in accordance with this law (UCC-Water, 2006).

It is predicted that through the on-farm irrigation and drainage infrastructure around 500-600 WUAs will be established in the republic, which may voluntarily unite into Water User Federations (UCC-Water, 2006).It is predicted that through the on-farm irrigation and drainage infrastructure around 500-600 WUAs will be established in the republic, which may voluntarily unite into Water User Federations (UCC-Water, 2006).

Although the specific Action Plans for transition to IWRM in the Kyrgyz Republic are not envisaged directly at the present moment, the necessary conditions for the IWRM implementation (favourable political environment, managerial roles and tools) are present in the national and sectoral programmes. Practically all the national development plans (on reduction of poverty level or improvement of living standards for achievement of the Millennium Development Goals, agriculture and energy sectors, nature protection spheres and others) are integrated ones and include the main IWRM principles to some extent (UCC-Water, 2006).Although the specific Action

Plans for transition to IWRM in the Kyrgyz Republic are not envisaged directly at the present moment, the necessary conditions for the IWRM implementation (favourable political environment, managerial roles and tools) are present in the national and sectoral programmes. Practically all the national development plans (on reduction of poverty level or improvement of living standards for achievement of the Millennium Development Goals, agriculture and energy sectors, nature protection spheres and others) are integrated ones and include the main IWRM principles to some extent (UCC-Water, 2006).

The specific action plans are being implemented within the framework of pilot irrigation systems of the IWRM-Fergana Project (UCC-Water, 2006).The specific action plans are being implemented within the framework of pilot irrigation systems of the IWRM-Fergana Project (UCC-Water, 2006).

As for how far the Kyrgyz Republic has come towards the institutional capacity building necessary for water resources management based on the IWRM principles, currently none of 17 functions characterizing institutional capacity works at the level of the real objective (UCC-Water, 2006):As for how far the Kyrgyz Republic has come towards the institutional capacity building necessary for water resources management based on the IWRM principles, currently none of 17 functions characterizing institutional capacity works at the level of the real objective (UCC-Water, 2006):

•There are some gaps in quality and coverage in preparation of laws and ancillary normative documents; reimbursement of water resources management costs; preparation of ecological and socio-economic assessments; monitoring of pollution loads; promotion of water demand management; water sharing; and intermediation in resolution of conflicts;•There are some gaps in quality and coverage in preparation of laws and ancillary normative documents; reimbursement of water resources management costs; preparation of ecological and socio-economic assessments; monitoring of pollution loads; promotion of water demand management; water sharing; and intermediation in resolution of conflicts;

•There are a lot of gaps in formulation of policy; collection of information about water resources and development of databases; preparation of water resources assessments; monitoring of water availability, use and quality, and aquatic ecosystems; planning of water resources use, protection and conservation; and cooperation in use of international water courses.•There are a lot of gaps in formulation of policy; collection of information about water resources and development of databases; preparation of water resources assessments; monitoring of water availability, use and quality, and aquatic ecosystems; planning of water resources use, protection and conservation; and cooperation in use of international water courses.

The main serious institutional limitations impeding execution of the necessary functions by the water management organizations are insufficient budget, equipment (for maintenance of databases, operative measurements and control over water discharges and quality parameters), material and technical supply (mainly with vehicles and machinery). At the same time the staff numbers and level of competence correspond to the technical complexity of the previously listed management functions (UCC-Water, 2006).The main serious institutional limitations impeding execution of the necessary functions by the water management organizations are insufficient budget, equipment (for maintenance of databases, operative measurements and control over water discharges and quality parameters), material and technical supply (mainly with vehicles and machinery). At the same time the staff numbers and level of competence correspond to the technical complexity of the previously listed management functions (UCC-Water, 2006).

Practically all heads of water management organizations are familiar with the IWRM principles. However, it should be stated that staff are only motivated to some extent to water management based on the IWRM principles (UCC-Water, 2006).Practically all heads of water management organizations are familiar with the IWRM principles. However, it should be stated that staff are only motivated to some extent to water management based on the IWRM principles (UCC-Water, 2006).

The decision-makers and specialists of water management organizations recognize that the managerial aspects of IWRM envisage fulfillment of the following requirements (UCC-Water, 2006):The decision-makers and specialists of water management organizations recognize that the managerial aspects of IWRM envisage fulfillment of the following requirements (UCC-Water, 2006):

•transition from management within the administrative boundaries to management within the hydrographic boundaries;•transition from management within the administrative boundaries to management within the hydrographic boundaries;

•transition from sectoral water management to integrated (systemic) management;•transition from sectoral water management to integrated (systemic) management;

•water demand management instead of the traditional supply management;•water demand management instead of the traditional supply management;

•introduction of cooperative forms of water resources management instead of administrative and command forms;•introduction of cooperative forms of water resources management instead of administrative and command forms;

•replacement of “closed” institutions by open (transparent) water resources management structures;•replacement of “closed” institutions by open (transparent) water resources management structures;

•use of the system for water resources management with the active participation of stakeholders (“bottom-up” approach) instead of the previous “top-down” approach.•use of the system for water resources management with the active participation of stakeholders (“bottom-up” approach) instead of the previous “top-down” approach.

Under the IWRM-Fergana Project a Department of the Interstate Commission for Water Coordination (ICWC) IWRM Training Centre was established in Osh. This training centre holds regular seminars within the framework of the IWRM-Fergana Project, as well as independent ones. Under the ICWC aegis at regional level (SIC ICWC Training Centre, Tashkent) special training, seminars, and roundtables for the representatives of different levels of the water sector hierarchy of all the Central Asian countries are held. The regular training programme is quite comprehensive and covers all the IWRM aspects (UCC-Water, 2006).Under the IWRM-Fergana Project a Department of the Interstate Commission for Water Coordination (ICWC) IWRM Training Centre was established in Osh. This training centre holds regular seminars within the framework of the IWRM-Fergana Project, as well as independent ones. Under the ICWC aegis at regional level (SIC

ICWC Training Centre, Tashkent) special training, seminars, and roundtables for the representatives of different levels of the water sector hierarchy of all the Central Asian countries are held. The regular training programme is quite comprehensive and covers all the IWRM aspects (UCC-Water, 2006).

The network of training centres was established in the Kyrgyz Republic within the framework of the On-farm Irrigation Project. This network comprises the Training Centre of the Department of Water Resources (the best one amongst such centres in terms of computer/office equipment availability), and training centres in the oblast and rayon departments of water management administrations (UCC-Water, 2006).The network of training centres was established in the Kyrgyz Republic within the framework of the On-farm Irrigation Project. This network comprises the Training Centre of the Department of Water Resources (the best one amongst such centres in terms of computer/office equipment availability), and training centres in the oblast and rayon departments of water management administrations (UCC-Water, 2006).

According to UCC-Water (2006), the Water Law, developed at the beginning of the formation of the current governmental management structure and market mechanisms in the economy, was in force up to 2005. Previously it has played a positive role in the development of water relationships.According to UCC-Water (2006), the Water Law, developed at the beginning of the formation of the current governmental management structure and market mechanisms in the economy, was in force up to 2005. Previously it has played a positive role in the development of water relationships.

The Water Code of the Kyrgyz Republic was adopted in January 2005. The objective of the Water Code adoption was establishment of the unified legal basis for regulation of water relationships in the area of water resources use and protection for the guaranteed and sufficient supply of the proper quality water for the population and various sectors of the economy. At the same time (according to Item 2 in Article 4 of the Constitution of the Kyrgyz Republic) the Code is aimed at establishment of a balance between protection of water resources and the ever-increasing economic activities of legal entities and physical persons (UCC-Water, 2006).The Water Code of the Kyrgyz Republic was adopted in January 2005. The objective of the Water Code adoption was establishment of the unified legal basis for regulation of water relationships in the area of water resources use and protection for the guaranteed and sufficient supply of the proper quality water for the population and various sectors of the economy. At the same time (according to Item 2 in Article 4 of the Constitution of the Kyrgyz Republic) the Code is aimed at establishment of a balance between protection of water resources and the ever-increasing economic activities of legal entities and physical persons (UCC-Water, 2006).

Being the main normative and legal act on management of water resources use and protection, it provides the basic statement of the governmental principles and policy in regard to water use, as well as rights and obligations of water users and various government bodies responsible for certain aspects of water resources management. It covers all issues starting from formation of the national water policy and strategy to use of water resources by the various sectors of the economy, including also issues associated with protection of water bodies and resources. Established for a long period of time the unified rules will eventually create a favourable environment for the attraction of internal and foreign investments for the development of agriculture and water resources management (UCC-Water, 2006).Being the main normative and legal act on management of water resources use and protection, it provides the basic statement of the governmental principles and policy in regard to water use, as well as rights and obligations of water users and various government bodies responsible for certain aspects of water resources management. It covers all issues starting from formation of the national water policy and strategy to use of water resources by the various sectors of the economy, including also issues associated with protection of water bodies and resources. Established for a long period of time the unified rules will eventually create a favourable environment for the attraction of internal and foreign investments for the development of agriculture and water resources management (UCC-Water, 2006).

The Water Code reflects the natural hydraulic cycle. All water concentrated on land surfaces, underground, in glaciers and snowfields, and rivers and canals, outflowing, flowing by or percolating through such systems is considered in the Water Code as a part of one and the same resource. Water does not recognize administrative boundaries and follows physical laws only, freely flowing from one territory into another (UCC-Water, 2006).The Water Code reflects the natural hydraulic cycle. All water concentrated on land surfaces, underground, in glaciers and snowfields, and rivers and canals, outflowing, flowing by or percolating through such systems is considered in the Water Code as a part of one and the same resource. Water does not recognize administrative boundaries and follows physical laws only, freely flowing from one territory into another (UCC-Water, 2006).

The Code reflects the area of responsibilities of the Zhogorku Kenesh (Parliament) and the government of the Kyrgyz Republic, as well as the other governmental bodies of water resources management taking into account expansion of their authorities as specified in the new version of the Constitution of the Kyrgyz Republic. The governmental body responsible for water resources management and realization of the Water Code is the State Water Administration. Its power, as well as the power of the other governmental management bodies associated with regulation of water resources use and protection, is given in detail in the Code (UCC-Water, 2006).The Code reflects the area of responsibilities of the Zhogorku Kenesh (Parliament) and the government of the Kyrgyz Republic, as well as the other governmental bodies of water resources management taking into account expansion of their authorities as specified in the new version of the Constitution of the Kyrgyz Republic. The governmental body responsible for water resources management and realization of the Water Code is the State Water Administration. Its power, as well as the power of the other governmental management bodies associated with regulation of water resources use and protection, is given in detail in the Code (UCC-Water, 2006).

Reformation of water resources management within the framework of the adopted Water Code is based on the basin principle. The basin principle considers the hydrological object as the most appropriate area for sustainable management of water activities. With some exceptions, there are specific and clearly defined basin systems in Kyrgyzstan that coincide with the oblasts' administrative boundaries. At the same time, configurations of some river basins have been and are being changed as a result of large-scale water management activities in the past and present, especially in the Chu and Syrdarya river basins. These large-scale and integrated irrigation systems comprise the main and interstate irrigation canals, which intake water from the main rivers and also from the small local sub-basins. As a result, the WUAs and municipalities receive water simultaneously from several sources in various sub-basins. Water supply from these unregulated local sub-basins often does not correspond to the norms and schedules and creates problems associated with complete waterlogging (UCC-Water, 2006).Reformation of water resources management within the framework of the adopted Water Code is based on the basin principle. The basin principle considers the hydrological object as the most appropriate area for sustainable management of water activities. With some exceptions, there are specific and clearly defined basin systems in Kyrgyzstan that coincide with the oblasts' administrative boundaries. At the same time, configurations of some river basins have been and are being changed as a result of large-scale water management activities in the past and present, especially in the Chu and Syrdarya river basins. These large-scale and integrated irrigation systems comprise the main and interstate irrigation canals, which intake water from the main rivers and also from the small local sub-basins. As a result, the WUAs and municipalities receive water simultaneously from several sources in various sub-basins. Water supply from these unregulated local sub-basins often does not correspond to the norms and schedules and creates problems associated with complete waterlogging (UCC-Water, 2006).

Traditionally water in Kyrgyzstan had been considered as a social and economic resource. The additional requirements are to use water as an integral part of the environment, to meet the needs of ecologically clear water, as well as protect the environment within the boundaries of the basins (UCC-Water, 2006).Traditionally water in Kyrgyzstan had been considered as a social and economic resource. The additional requirements are to use water as an integral part of the environment, to meet the needs of ecologically clear water, as well as protect the environment within the boundaries of the basins (UCC-Water, 2006).

Planning measures are aimed to ensure such mechanisms for participation in water use that would correspond to the norms of the current democratic and liberal economy. One of the important aspects of the transition period economy, reflected and realized in basin planning, is the gradual transition from total governmental control to the concept of end water user rights and obligations that ensures guarantees of ownership rights and facilitates investments, democratic and socio-economic development, and environmental protection (UCC-Water, 2006).Planning measures are aimed to ensure such mechanisms for participation in water use that would correspond to the norms of the current democratic and liberal economy. One of the important aspects of the transition period economy, reflected and realized in basin planning, is the gradual transition from total governmental control to the concept of end water user rights and obligations that ensures guarantees of ownership rights and facilitates investments, democratic and socio-economic development, and environmental protection (UCC-Water, 2006).

Another objective of the transfer of responsibilities from central political, regional and sectoral control to regional basin management is the broader involvement of the public and stakeholders in order to facilitate implementation of water policy reflected in the basin plans. The basin plans are required for ensuring the objective assessment and distribution of the available water resources and as a basis for participation and cooperation in the inevitable competition for water amongst regions and sectors of the economy. Basin plans also envisage assessment and distribution of the total impact on sanitary conditions along the entire river course for safety reasons, instead of controlling overflow by the local authorities at the estuary that is carried out as a measure for environment protection (UCC-Water, 2006).Another objective of the transfer of responsibilities from central political, regional and sectoral control to regional basin management is the broader involvement of the public and stakeholders in order to facilitate implementation of water policy reflected in the basin plans. The basin plans are required for ensuring the objective assessment and distribution of the available water resources and as a basis for participation and cooperation in the inevitable competition for water amongst regions and sectors of the economy. Basin plans also envisage assessment and distribution of the total impact on sanitary conditions along the entire river course for safety reasons, instead of controlling overflow by the local authorities at the estuary that is carried out as a measure for environment protection (UCC-Water, 2006).

One of the important tasks of the Water Code is the establishment of official mechanisms for coordination of activities and exchange of information amongst stakeholders. For these purposes the Water Code envisages establishment of a National Water Council. This Council will coordinate activities of water users and consumers, develop and submit to the government of the Kyrgyz Republic a national water strategy, and manage the activities of the state water administration. Such a body will represent the interests of the entities concerned and in addition it may be entrusted with specific tasks. Management of water resources use and protection are envisaged to be carried out on the basis of hydrographic territories, which should be established by the government of the Kyrgyz Republic on the basis of proposals of the National Water Council. Coordination of activities in the water sector at the level of main basins should be carried out by the Basin Council established in each main basin. The activities of the Basin Council are regulated by the Provision approved by the government of the Kyrgyz Republic (UCC-Water, 2006).One of the important tasks of the Water Code is the establishment of official mechanisms for coordination of activities and exchange of information amongst stakeholders. For these purposes the Water Code envisages establishment of a National Water Council. This Council will coordinate activities of water users and consumers, develop and submit to the government of the Kyrgyz Republic a national water strategy, and manage the activities of the state water administration. Such a body will represent the interests of the entities concerned and in addition it may be entrusted with specific tasks. Management of water resources use and protection are envisaged to be carried out on the basis of hydrographic territories, which should be established by the government of the Kyrgyz Republic on the basis of proposals of the National Water Council. Coordination of activities in the water sector at the level of main basins should be carried out by the Basin Council established in each main basin. The activities of the Basin Council are regulated by the Provision

approved by the government of the Kyrgyz Republic (UCC-Water, 2006).
For the first time in the history of water legislation of the country the Water Code envisages provisions on the minimum ecological river flow. In Article 64 of the Water Code this requirement is written as follows (UCC-Water, 2006):For the first time in the history of water legislation of the country the Water Code envisages provisions on the minimum ecological river flow. In Article 64 of the Water Code this requirement is written as follows (UCC-Water, 2006):
”On the basis of approved proposals of the authorized state agency for environment protection and the State Water Administration the Government of the Kyrgyz Republic establishes the minimum requirements to the ecological flow for the certain rivers and water bodies for conservation of fish resources and the aquatic ecosystems.””On the basis of approved proposals of the authorized state agency for environment protection and the State Water Administration the Government of the Kyrgyz Republic establishes the minimum requirements to the ecological flow for the certain rivers and water bodies for conservation of fish resources and the aquatic ecosystems.”
The Water Code envisages establishment of the advisory National Commission on Dam Safety and advisory commissions on irrigation and drainage at the levels of republic, main basin and rayon (UCC-Water, 2006).The Water Code envisages establishment of the advisory National Commission on Dam Safety and advisory commissions on irrigation and drainage at the levels of republic, main basin and rayon (UCC-Water, 2006).
Taking into account global experience in water resources management, provisions on establishment of the licensing water use system had been included in the Water Code. Necessity for establishment of the licensing water use system had been caused by the ill-conceived and hasty abolition of water use licensing envisaged by the Law on amendments of Law of the Kyrgyz Republic on Licensing adopted in January 2001 (UCC-Water, 2006).Taking into account global experience in water resources management, provisions on establishment of the licensing water use system had been included in the Water Code. Necessity for establishment of the licensing water use system had been caused by the ill-conceived and hasty abolition of water use licensing envisaged by the Law on amendments of Law of the Kyrgyz Republic on Licensing adopted in January 2001 (UCC-Water, 2006).
Efficient water resources management is ensured through the system of various regulating mechanisms that identify the type of activities allowable in the Kyrgyz Republic on the basis of water use licenses awarded in accordance with the conditions and provisions of the Water Code. The conditions and provisions of the licensing water use system are described in detail in the Code. They establish the guaranteed rights to water use for a long period and obligations of these right owners to use water resources in an efficient manner taking into account the requirements of environmental protection. Thereby, possibilities for corruption in water distribution are reduced, the guaranteed supply of irrigation water increased, and crop yields improved leading to poverty reduction in rural areas (UCC-Water, 2006).Efficient water resources management is ensured through the system of various regulating mechanisms that identify the type of activities allowable in the Kyrgyz Republic on the basis of water use licenses awarded in accordance with the conditions and provisions of the Water Code. The conditions and provisions of the licensing water use system are described in detail in the Code. They establish the guaranteed rights to water use for a long period and obligations of these right owners to use water resources in an efficient manner taking into account the requirements of environmental protection. Thereby, possibilities for corruption in water distribution are reduced, the guaranteed supply of irrigation water increased, and crop yields improved leading to poverty reduction in rural areas (UCC-Water, 2006).
The Water Code envisages public participation in decision-making on management of water resources use and protection and provides the right to access to the appropriate information through the water rights licensing system. As admitted by everybody, the Kyrgyz Republic is the leader in the region in establishment of WUAs, their involvement in the water resources management process, and state support to development of these associations. There are currently 430 WUAs in the Kyrgyz Republic (UCC-Water, 2006).The Water Code envisages public participation in decision-making on management of water resources use and protection and provides the right to access to the appropriate information through the water rights licensing system. As admitted by everybody, the Kyrgyz Republic is the leader in the region in establishment of WUAs, their involvement in the water resources management process, and state support to development of these associations. There are currently 430 WUAs in the Kyrgyz Republic (UCC-Water, 2006).
According to UNECE, the fourth Steering Committee meeting of the European Union (EU) Water Initiative National Policy Dialogue (NPD) on integrated water resource management (IWRM) in Kyrgyzstan took place on May 18 2011 in Bishkek, Kyrgyzstan. The meeting was organized by the State Committee on Water Economy and Land Reclamation of the Kyrgyz Republic and the UNECE.According to UNECE, the fourth Steering Committee meeting of the European Union (EU) Water Initiative National Policy Dialogue (NPD) on integrated water resource management (IWRM) in Kyrgyzstan took place on May 18 2011 in Bishkek, Kyrgyzstan. The meeting was organized by the State Committee on Water Economy and Land Reclamation of the Kyrgyz Republic and the UNECE.
The National Water Policy Dialogue of the Kyrgyz Republic started in 2008 but was interrupted by the political changes in 2010. Radical changes in the government and in the institutional structure for water management have taken place since and the renewal of NPD activities responded to the need to support continued water sector reform as well as the inter-agency dialogue and intersectoral cooperation.The National Water Policy Dialogue of the Kyrgyz Republic started in 2008 but was interrupted by the political changes in 2010. Radical changes in the government and in the institutional structure for water management have taken place since and the renewal of NPD activities responded to the need to support continued water sector reform as well as the inter-agency dialogue and intersectoral cooperation.
The National Water Policy Dialogue meeting focused on institutional aspects of IWRM, water legislation, the use of economic instruments in a planned OECD project in the Issyk Kul basin as well as the application of the UNECE/WHO Euro Protocol on Water and Health. The meeting was also used for exchange of information and coordination of donor-funded activities.The National Water Policy Dialogue meeting focused on institutional aspects of IWRM, water legislation, the use

of economic instruments in a planned OECD project in the Issyk Kul basin as well as the application of the UNECE/WHO Euro Protocol on Water and Health. The meeting was also used for exchange of information and coordination of donor-funded activities.

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

3. GEOPOLITICAL ASPECTS

Kyrgyzstan is a landlocked country in Central Asia with a total area of 198,500km2. It is bordered in the north by Kazakhstan, in the east and southeast by China, in the southwest by Tajikistan and in the west by Uzbekistan. It became independent from the Soviet Union in August 1991.

The region is rich in oil, minerals, and other natural resources. Turkmenistan and Kazakhstan, with their oil and gas fields, have attracted foreign investment. Uzbekistan and Tajikistan have capitalized on their cotton and mineral industries. Kyrgyzstan has sought to develop its gold industry and hydropower production. In geopolitical terms, the region is at the crossroads of several rival powers – Russia, China, Pakistan, Iran and India – all of which have or are seeking regional domination. The United States has also been extending its influence into the area, leading some forces in Russia to call for a "more ambitious" policy to regain its role there (Traynor, 2001).

Water is a key issue in the region. Ninety per cent of the water resources are concentrated in Kyrgyzstan and Tajikistan, while the main consumers – Uzbekistan and Kazakhstan – can supply only 14 per cent and 45 per cent, respectively, of their water needs. Uzbekistan alone consumes more than half the region's water resources. As a result, though, Kyrgyzstan and Tajikstan control the water needed by Uzbekistan and Kazakhstan. The upstream states view water as a commodity for trade and profit, especially since they are poorly endowed with other resources. Control over water is also important for them as they need it to generate much of their own power needs (Smith, 1995).

These differences can often be settled through negotiation but the relative leverage of the two sides shifts during the year. In summer, the downstream countries have less leverage given their high water needs, while in winter the consumer states have the advantage because they can cut off their coal and gas supplies or restrict transport on their roads. A large number of bilateral agreements have been signed to manage these issues. For example, between 1997 and 2004, Kyrgyzstan and Uzbekistan alone signed 10 agreements and held a large number of meetings. Uzbekistan's gas and Kyrgyzstan's water are major bargaining chips in this relationship. In addition, Uzbekistan has some control over the supply of water to southern parts of Kazakhstan which at times it has reduced, triggering angry protests by Kazakh peasants, as well as high-level political dispute between the two countries (Karaev, 2005).

The existence of border disputes intensifies these problems. This is especially evident in the case of Uzbekistan, which has border disputes with all the countries of the region. The most acute tensions exist between Uzbekistan and Kyrgyzstan over two enclaves that belong to the latter. Uzbekistan and Tajikistan also claim parts of each other's territories. Numerous clashes have occurred on the Tajik-Uzbek and Kyrgyz-Uzbek borders, leading to the closing of frontiers and – especially by Uzbekistan – laying of minefields (Pannier, 1999).

Despite the signing of many water agreements, however, the results have been unstable. Countries have broken their commitments at times when their leverage was greater and they thus believed they could obtain a better deal. Leaders are under constant domestic pressure – especially from farmers – to improve the terms of these arrangements. This does not apply only to the upstream countries but also to the downstream ones (Karaev, 2005).

Growing concerns over the falling level of water in the Aral Sea and its disastrous consequences have added another factor. International agencies, including the World Bank, the United Nations (UN) and the Organization of Security and Cooperation in Europe (OSCE) have offered assistance while also pressuring countries to regulate the water flow in order to prevent the Aral Sea from drying up even more. Thus, the situation is extremely complex (Karaev, 2005).

In the downstream countries of Kazakhstan and Uzbekistan, especially in the latter, the political leadership is heavily dependent on the cotton industry, the single biggest sector and consumer of water. Kazakhstan is an exporter of wheat. Other pressures also exist in these countries. Widespread poverty in rural areas has encouraged militant and separatist groups. The overpopulated, poverty-stricken, cotton-producing valley, home to 20 per cent of the region's entire population, has been the scene of many violent incidents since 1989 (Goble et al, 1997).

With independence, the downstream countries have undertaken a policy of energy self-sufficiency and reduced their dependency on imported hydropower from their neighbours. Upstream countries have pursued a policy of developing and utilizing their hydropower potential which has significantly reduced the water flows to downstream countries. The urban population of upstream countries is, to a large extent, dependent on the gas and coal supply from downstream countries, especially during winter. The downstream countries thus want water for cotton and can use their energy supplies to bargain for it; the upstream countries can bargain with their water but their energy strategy requires retaining more of it (Koichiev, 2001).

Thus, the downstream and upstream countries face different domestic pressures. Their interests are often diametrically opposed to each other and offer little flexibility in negotiating the terms of joint use of water resources (Putnam, 1993). Uzbekistan could reduce its water needs by shifting away from cotton. However, cotton is such a big asset to generate revenue and foreign exchange that the government is unwilling to restructure its agriculture. Any fall in cotton income – which is heavily dependent on water supplies – would only further impoverish a rural population already in difficult straits (Karaev, 2005).

In some ways, though, the upstream countries are even worse off. They are poorer, less powerful, and have few resources to develop. Water is one of the few assets Kyrgyzstan and Tajikistan possess. Yet, if they face retaliatory cutbacks in gas supplies, their urban populations put pressure on the governments for a more flexible water strategy. Giving up more water, however, undercuts their hydroelectric production which only makes them more vulnerable to energy blackmail from their downstream neighbours (Karaev, 2005).

Given all these factors, it is not surprising that bilateral and multilateral water arrangements are constantly being renegotiated, a factor which only increases the importance, controversy and tension around this resource's distribution. As one expert summarizes the situation: "The conflict of interest over water resources between the upstream and the downstream states is now addressed in an ad hoc manner, through annual bilateral negotiations involving compensations of the upstream states, in the form of coal, natural gas or electricity supplies by the downstream states. However, the implementation of these bilateral agreements is difficult, if not impossible" (Abdullaev, 2001).

An agreement on the joint use of water and energy resources was reached on March 17 1998 in Bishkek between three countries – Kazakhstan, Kyrgyzstan, and Uzbekistan. Three months later Tajikistan also joined the agreement. The agreement was primarily driven by the biggest consumer of water – Uzbekistan. Although Tajikistan controls a significant part of water resources, it was not invited. The situation surrounding those negotiations and the resulting agreement provides an interesting case study on these matters (Karaev, 2005).

In 1997 tensions between Kyrgyzstan and Uzbekistan escalated, involving a military build-up by Uzbekistan across from the water reservoir located close to its border on the territory of Kyrgyzstan. This move raised concerns and anger in Kyrgyzstan. The Kyrgyz government adopted a resolution declaring water as a tradable commodity, and codifying its right to use it for profit. It threatened to sell water to China if Uzbekistan failed to pay for it (Karaev, 2005).

Not long before the negotiations started, in February 1998, Uzbekistan cut off gas supplies to both water-rich countries – Kyrgyzstan and Tajikistan. This action also aroused anger in those two states, with the Kyrgyz government using especially strong rhetoric in denouncing it. The Uzbek side answered with similarly tough words. Apparently, aside from the water itself, the Uzbek government was also trying to make gains on territorial disputes with its neighbours (Eggleston, 2002).

Threatening to use water as a weapon, Kyrgyzstan suggested that it might release so much water from its Toktogul reservoir as to destroy large cotton fields. Both Kyrgyzstan and Tajikistan also announced that they would raise the production of hydropower – i.e., using more water – to reduce the need to import Uzbek gas. Tense relations marked the beginning of negotiations (Hogan, 2000).

Downstream countries also have more leverage during the winter, when their upstream neighbours are dependent on them for energy supply and roads. Upstream countries in turn, have the advantage during the hot season, when crops in their downstream neighbours require more water (Karaev, 2005).

Thus, the agreement was reached when downstream countries perceived that Kyrgystan did indeed – as its regime had originally assumed – have the advantage over Tajikistan. Therefore, downstream countries were more flexible in their negotiations with Kyrgyzstan. They promised Kyrgyzstan financial contributions toward maintaining water facilities and the delivery of gas and coal without delay or stoppages (Karaev, 2005).

Being an ally of Russia certainly gives each of the upstream countries additional leverage in negotiations and puts pressure on downstream countries. Pressure from international organizations on all countries to save the Aral Sea, in turn, gives additional leverage to downstream countries. International organizations provide financial assistance to these countries for producing alternative crops which require less water while pressuring upstream countries to discharge more water in order to ensure a sufficient level in the sea (Karaev, 2005).

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