

Canada and Kazakhstan may seem like they are far apart, separated by oceans on opposite sides of the world. But our countries have much in common, and our societies have many shared experiences. These similarities make us natural partners in a globalized, globally competitive world. They give us a solid foundation for partnership that will create better futures for our people and the world.

The Canada in Kazakhstan conference, organized by the Embassy of Canada to Kazakhstan in partnership with the Library of the First President of Kazakhstan, created a forum where students and academics can discuss, debate, and generate ideas for further collaboration between Canada and Kazakhstan. Students, faculty, and independent scholars were invited to submit papers on this topic.

The following is one of the two **3rd place papers**:

UNTAPPED POTENTIAL: HARNESSING CANADIAN WATER MANAGEMENT EXPERTISE TO ENHANCE WATER SECURITY IN KAZAKHSTAN

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INTRODUCTION

The growing scarcity of fresh and clean water is undeniably among the most serious issues confronting humanity in the 21st century. After all, safe drinking water, widely regarded as a global common, is essential for sustaining life, but it is also a finite resource and no element in the world can substitute it. According to a 2015 report by UNICEF and the World Health Organization, 663 million people or approximately one in ten people lack access to safe water.¹

Moreover, by 2050, more than 2.3 billion people are projected to experience “severe water stress” due to increasing strains on freshwater availability, especially in Central Asia.² As population, income, and urbanization continue to grow, together with the increase in threats posed by climate change, the demands for water in the food, energy, and other industrial sectors will undoubtedly rise. These challenges will increase the risk of state volatility, and will exacerbate geopolitical tensions, potentially jeopardizing agricultural and resource development, but also social welfare and quality of life. In other words, water scarcity is a security threat.

Persistent challenges to water resources in Kazakhstan – from hydrological variability to pressures on agriculture to antiquated municipal infrastructure – all constitute significant threats to the country’s industries, businesses, cities and the well-being of its

people. Recognizing the danger of inaction in tackling these issues, Kazakhstan is taking the lead among countries of Central Asia and the Commonwealth of Independent States (CIS) in addressing some of these challenges by aspiring to make the leap to a green economy. In May 2013, President Nursultan Nazarbayev and his government launched Kazakhstan’s Green Economy Concept, which outlines steps the country will take to transition to a green economy, one of which critically encompasses the resourceful use of water.³ The bold vision has presented Kazakhstan with an immense opportunity to tackle long existing water-related challenges and offers an avenue for world water management leaders, particularly Canada, to become key contributors in Kazakhstan’s green transformation. Possessing a large share of the world’s freshwater supply and consistently developing cutting-edge water management and science, Canada is well-positioned to support Kazakhstan, its largest commercial partner in Central Asia, in gaining access to clean, safe, and sustainable water resources. Canada’s research capabilities, water clusters, water resource management systems, experience with hydrological challenges, human capital, as well as the variety of Canadian companies that deliver water-related solutions can make the country a very crucial partner in enhancing water security in Kazakhstan.

¹ “MDG Assessment – Drinking Water,” *Progress on Sanitation and Drinking Water: 2015 Update and MDG Assessment* (Geneva: UNICEF and World Health Organization, 2015), Pg. 5.

² *OECD Environmental Outlook to 2050: The Consequences of Inaction* (OECD, 2012), Pg 4.

³ Caroline Erin Elkin, “It’s Not Easy Going Green: Kazakhstan’s Transition to a Green Economy,” (Honours Thesis, Dickinson College, 2015), http://scholar.dickinson.edu/cgi/viewcontent.cgi?article=1194&context=student_honors.

REGIONAL WATER MANAGEMENT AND SECURITY IN CENTRAL ASIA

The bulk of fresh water in Central Asia originates from run-off from the Pamir and Tian Shan mountain ranges situated in the East, which feed into the two rivers that represent the lifelines of Central Asia: the Amu Darya and the Syr Darya, running west and north respectively towards the Aral Sea.⁴ These major rivers are shared and transit multiple countries resulting in a degree of rigidity between jurisdictions that control upstream water flows – Tajikistan and Kyrgyzstan – and their downstream neighbours – Uzbekistan, Kazakhstan, and Turkmenistan – which do not receive the water requisite for agriculture, industry and cities to thrive.⁵ To make matters worse, Central Asia is located within the world's arid and semi-arid vegetation zones, hence regional agriculture in particular, especially one based on crops such as cotton and rice, necessitates intensive irrigation; demanding an advanced, multifaceted water supply system that has not fully been put in place.

It is critical to consider the legacy of Soviet water management in Central Asia in order to truly comprehend the current situation in the region. Under the Soviet administration, water planners approached water as an effectively limitless resource, with little if any consideration of conservation, efficiency, or the consequences of overuse.⁶ Importance

was placed instead on meeting production quotas assigned by Moscow. There were virtually no assessments conducted in order to measure residential or agricultural use, and the supply system, from piping in apartments buildings to the irrigation ditches, was pervious and uneconomical.⁷ This approach to water management persists in many parts of Central Asia today and signifies one of the major obstacles to restructuring both the practices and infrastructure bequeathed by the Soviet regime.

Water resource management in Central Asia is directly tied to domestic and regional security. According to the Food and Agriculture Organization (FAO) of the United Nations, water is Central Asia's "most precious resource and its use is the most conflict-prone."⁸ The five Central Asian states have signed several water-sharing agreements since their independence, such as the 1992 Almaty Agreement, but these have by and large failed to fully resolve tensions.⁹ For example, in response to environmental and socioeconomic consequences of the Aral Sea crisis, one of the planet's worst ecological calamities triggered by human activity, a governing body called the Interstate Commission for Water Coordination of Central Asia (ICWC) was established by the Central Asian states to, *inter alia*, facilitate water allocations, conduct scientific research, and effectively manage the river basin activities. However, setting up water quotas that were suitable to all turned out to be a difficult task; leading to a state of paralysis on several occasions when interests of the countries conflicted.¹⁰ This is compounded by the failure of states to

⁴ Beatrice Mosello, "Water in Central Asia: A Prospect of Conflict or Cooperation?," *Journal of Public and International Affairs* 19 (2008): Pg. 152, <https://www.princeton.edu/jpia/past-issues-1/2008/9.pdf>.

⁵ Reuel R. Hanks, *Global Security Watch – Central Asia* (Santa Barbara: Praeger Security International, 2010), Pg. 85.

⁶ Ibid, Pg. 86.

⁷ Ibid.

⁸ Karen Frenken, "Irrigation in Central Asia in Figures: Aquastat Survey – 2012," *FAO Reports* 39 (2013): Pg. 31, <http://www.fao.org/3/a-i3289e.pdf>.

⁹ Behrooz Abdolvand et al., "The Dimension of Water in Central Asia: Security Concerns and the Long Road of Capacity Building," *Environmental Earth Science* 73 (2): Pgs. 897-912, doi: 10.1007/s12665-014-3579-9.

¹⁰ Beatrice Mosello, "Water in Central Asia: A Prospect of Conflict or Cooperation?," *Journal of Public and International Affairs* 19 (2008): Pg. 161, <https://www.princeton.edu/jpia/past-issues-1/2008/9.pdf>.

recognize the need for concerted water conservation arrangements. The ability for the ICWC to ensure compliance to negotiated agreements is essential, but an enforcement mechanism is not in place and, hence, dilutes the institution's credibility.¹¹ The Commission's limited mandate is another challenge as its current focus is restricted to water division, and thus cannot concern itself with issues pertaining to agriculture and energy, which are the largest water-guzzling sectors.¹² Furthermore, the ICWC has been accused of not being transparent, as well as not including more NGOs, Water Users' Associations, and other important stakeholders in the decision-making process.¹³ Moreover, there is insufficient financing, which results in a lack of funds for equipment and monitoring. According to ICWC reports, only Turkmenistan and Uzbekistan have been continuing to contribute funds to the body.¹⁴

In the coming years, management of water resources will become even more pivotal to regional security and stability. The Soviet-era canal systems that supply water for irrigation in downstream countries – primarily Uzbekistan and Turkmenistan – have reached the end of their lifespan and will only deteriorate further.¹⁵ The FAO reports that leaking and inept canals in some Central Asian countries already result in the loss of 65 per cent of irrigation water before it even reaches the fields.¹⁶ In addition, as the region develops economically, more and more water sources are being polluted or salinized through over-irrigation, excessive fertilization and improper handling of industrial, nuclear and human waste.¹⁷ Moreover, population

growth rates remain relatively high in the Fergana Valley, the region that consumes the greatest amount of Central Asia's irrigation water, and agriculture, especially cotton production, is likely to remain the most important sector of employment for the foreseeable future.¹⁸ Uzbekistan, Central Asia's most populous country, and Tajikistan's population growth rates are also expected to increase.¹⁹ As demand for clean, potable water rises, so too will interstate tensions within a hydro-political complex.

WATER SCARCITY IN KAZAKHSTAN

Approximately 58 per cent of Kazakhstan's landlocked territory is dominated by vast and arid desert and semi-desert plains, which are zones of low humidity, and about 10 per cent is occupied by mountains.²⁰ While oil, gas, and minerals are in abundance, fresh water availability in the country is one of the lowest in Central Asia.²¹ Water – both surface and underground – is also distributed unevenly, and its quality and quantity vary depending on the area. Glaciers play a key role, being the only freshwater reservoirs, although the majority are located in the south and east at more than 4,000 meters above sea level. A lack of fresh and clean water for major water consumers within agriculture, industry, and utility and housing facilities has largely constrained resource development in the country.

A defined feature of Kazakhstan is that large parts of its territory form the endorheic basins

¹¹ Ibid, Pg. 162.

¹² Ibid.

¹³ Ibid, Pg. 163.

¹⁴ Ibid, Pg. 162.

¹⁵ Jacqueline Lopour, "Geopolitics at the World's Pivot: Exploring Central Asia's Security Challenges," *CIGI Papers* 80 (2015): Pg. 4, https://www.cigionline.org/sites/default/files/cigi_paper_no.80_web_1.pdf.

¹⁶ Karen Frenken, "Irrigation in Central Asia in Figures: Aquastat Survey – 2012," *FAO Reports* 39 (2013): Pg. 31, <http://www.fao.org/3/a-i3289e.pdf>.

¹⁷ Ibid.

¹⁸ Reuel R. Hanks, *Global Security Watch – Central Asia* (Santa Barbara: Praeger Security International, 2010), Pg. 86.

¹⁹ Ibid.

²⁰ UNDP Kazakhstan, *Water Resources of Kazakhstan in the New Millennium* (Almaty: LEM Printhouse, 2004), Pg. 12.

²¹ "OECD Studies on Water Sustainable Business Models for Water Supply and Sanitation in Small Towns and Rural Settlements in Kazakhstan," *OECD Studies on Water* (2016): Pg. 17, <http://dx.doi.org/10.1787/9789264249400-en>.

of the Caspian Sea, the Aral Sea, Lake Balkhash, Emin Valley, Lake Tengiz, etc., which are closed inland drainage basins and do not flow out into an ocean.²² Consequently, a significant amount of industrial pollutants amasses in the lower reaches of the country's transboundary rivers and, in some cases, have caused shrinking. Thus the issues of water resource management and water quality has grown to be a fundamental issue in Kazakhstan.

As in other parts of Central Asia, the current centralized water supply system in Kazakhstan is unreliable and does not deliver water of potable quality. Due to poor conditions, water leakages in the supply systems are substantial and account for some 20 to 30 per cent of the total volume of water supplied. Some of the system's segments have surpassed the standard operating term of 25 years. In 2009, only 36 per cent of the water supply network was functional and 64 per cent required an upgrade.²³ Sewage systems are also in a critical state of disrepair. A large amount of contaminants found in wastewater originate from chemical industries, petroleum refining, machine building industries, and non-ferrous extractive metallurgy.²⁴

The monitoring of the environment and climate in Kazakhstan is executed by the *Kazgidromet*, a republican state enterprise that reports to the Ministry of Environment Protection. A network of over 6,000 hydrological observation stations gather data on water bodies and water resources.²⁵ Water quality observations are subsequently made and water sample analyses are

conducted in laboratories. However, it is important to note that the number of observation stations on water bodies have reduced. Additionally, while groundwater studies are conducted, it was found that observation stations have been spread unevenly and, in many instances, are positioned in more developed areas, while provinces and regions of ecological concern remain unstudied.²⁶

The Kazakhstani Government's Committee for Water Resources oversees eight basin water management units that encompass the country's drainage basins. However, management issues have plagued the Committee. Restructured on several occasions, the Committee's operative changes have had a negative impact on human resources, materials, and equipment. According to a UNDP report, there has been "a loss of key personnel with scientific, technical and project expertise, while it takes 15 to 20 years to train and qualify a skilled designer engineer."²⁷

Water-related research is largely absent in Kazakhstan, with not even one local research institute on the subject matter.²⁸ Nevertheless, nearly 300 environmental organizations are active in oblasts across the country and at least half possess a mandate aimed at solving water-related issues.²⁹ Their work ranges from generating strategies to tackle water challenges to cleaning riverbeds to environmental education.³⁰

²² UNDP Kazakhstan, *Water Resources of Kazakhstan in the New Millennium* (Almaty: LEM Printhouse, 2004), Pg. 12.

²³ Leong Ching and Karlygash Karamanova, "Place of Water in Kazakhstan 2050 Strategy," *The Astana Times*, December 25, 2014, <http://astanatimes.com/2014/12/place-water-kazakhstan-2050-strategy/>.

²⁴ UNDP Kazakhstan, *Water Resources of Kazakhstan in the New Millennium* (Almaty: LEM Printhouse, 2004), Pg. 24.

²⁵ Climate Change Coordination Centre Kazakhstan, "Survey: Issues of Environmental Protection in the

Republic of Kazakhstan. Environmental Situations. Problems and Solution,," Pg. 51,

http://www.env.go.jp/earth/coop/coop/c_report/kazakhstan_h17/japanese/pdf/015.pdf.

²⁶ Ibid, Pg. 52.

²⁷ UNDP Kazakhstan, *Water Resources of Kazakhstan in the New Millennium* (Almaty: LEM Printhouse, 2004), Pg. 59.

²⁸ Ibid.

²⁹ Ibid, Pg. 60.

³⁰ Ibid.

KAZAKHSTAN'S COMMITMENT TO THE GREEN ECONOMY

While changing domestic water conditions in Kazakhstan are creating rapidly shifting demands, it is also furnishing opportunities for innovation on many levels. While legislation on natural resources, including the Water Code, have been revised to reflect shifting circumstances and attitudes over the years, President Nazarbayev formally recognized Kazakhstan's problem of water scarcity in 2014. He highlighted the importance of "determining the need to construct new dams, conduct research in ground water use and flooding of pastures."³¹ As part of the ambitious 2050 Strategy, President Nazarbayev aims to transform the country from being "one of the world's premier hydrocarbon energy producers to a model "green" economy."³² Many initiatives are already underway and others are in progress. For example, Astana will be hosting 'EXPO 2017', a major international exhibition with the theme 'Future Energy', which reflects the country's commitment to 'greening' its economy. In 2013, Kazakhstan was also the first CIS country to unveil a national carbon trading scheme to curb greenhouse gas emissions, requiring emitters of more than 20,000 tonnes of carbon dioxide to participate in a cap-and-trade system.³³

Water resource management is becoming a key part of the Government's goal of ensuring that the country is an effective and careful

user of water resources. According to government sources, Kazakhstan's water management plan "aims to curb the waste of drinking water by citizens, as well as to improve the efficiency of irrigation systems in order to reduce irrigation usage by 40 per cent."³⁴ The plan is also focused on seeking a "more productive regional dialogue on the joint use of rivers that are shared with the neighboring countries that should be based on fairness and economic attractiveness."³⁵

In 2008, the UNDP and the Norwegian government jointly sponsored the "National Integrated Water Resources Management and Water Efficiency Plan for Kazakhstan," becoming the first country in Central Asia to prepare such a plan that would aim to balance domestic water supply and demand needs.³⁶ While the project does not cover national information management and infrastructure rehabilitation, which are considered areas of priority for the Government, its purpose is to holistically manage Kazakhstan's river basins together with water user stakeholders and ensure environmental sustainability.³⁷

Similarly, the effective use of water has propelled the launch of another joint project with the European Union and UN agencies focused on incorporating green practices and technologies in Kazakhstan's water sector.³⁸ In particular, it will introduce "a modern environmental governance system, state-of-the-art water management policies and practices, enhanced environmental impact assessment procedures and economic incentives for the sustainable use of water resources."³⁹

³¹ "Kazakhstan faces the problem of water scarcity – President Nazarbayev," *Kazinform*, November 18, 2014, <http://www.inform.kz/eng/article/2718155>.

³² "Conception of Kazakhstan on transition to green economy," *Kazakhstan 2050*, <https://strategy2050.kz/en/news/1211/>.

³³ "Kazakhstan: Leading the Green Revolution in Central Asia," *KZ Green Energy*, <http://kzgreenenergy.com/>.

³⁴ "Water Conservation," *KZ Green Energy*, <http://kzgreenenergy.com/water-conservation/>.

³⁵ *Ibid.*

³⁶ A.K. Kenshimov, "National Plan for Integrated Water Resources Management and Water Efficiency in

Kazakhstan," *State Committee on Water Resources of the Ministry of Agriculture of the Republic of Kazakhstan*, http://www.cawater-info.net/4wwf/pdf/kenshimov_e.pdf.

³⁷ UN ECOSOC, "National Integrated Water Resources Management and Water Efficiency Plan," <https://webapps01.un.org/nvp/indpolicy.action?id=901>.

³⁸ "Water Use Key to Launch of Kazakhstan's Transition to Green Economy," *KZ Green Energy*, March 3, 2016, <http://kzgreenenergy.com/water-use-key-to-launch-of-kazakhstan-transition-to-green-economy/>.

³⁹ UNDP Kazakhstan, "Joint EU/UNDP/UNECE project "Supporting Kazakhstan's Transition to a Green Economy

TAPPING INTO CANADA'S WATER STRENGTHS

Canada is known for its expertise in water management and water infrastructure regulation and is strongly linked to water, with 20 per cent of the world's fresh water stored in its lakes. Moreover, Canada ranks high in water quality and is a significant growth market for water and wastewater systems.⁴⁰

From FER-PAL Infrastructure to Clearford Water Systems, Canada has a mounting number of competitive water enterprises offering goods, services and advice in world markets. Canadian companies have been robust indicators of the country's ability to serve as a water opportunities solution provider. In fact, over the years, Canadian companies have featured prominently on the list of the Global Cleantech 100.⁴¹ Two Canadian water companies were also among the top five water tech companies listed in the 'Artemis Project Top 50 Water Tech Listing,' and five Canadian companies were among its top 50 general water companies.⁴² Winner of the 2015 Canada Oil and Gas Award for Water Management Company of the Year, Integrated Sustainability Consultants is a Calgary-based organization that specializes in providing sustainable water, waste and energy solutions.⁴³ Another Canadian company, Ostara, works to retrieve vital chemical elements – nitrogen and phosphorus – found in wastewater and converts them into fertilizer.⁴⁴ British Columbia's Singer Valve,

which designs and manufactures control valves that control water pressure resulting in reduced water leakage, is considered a pioneer in its field.

Innovation is a key driver of Canada's success in water resource management. One example of Canadian novelty is RADARSAT-2. Currently in its eighth year of operation, RADARSAT-2 is owned and operated by MacDonald, Dettwiler and Associates Ltd. in Brampton and is Canada's top of the line Earth observation satellite that augments environmental monitoring, resource management and mapping in Canada and around the world.⁴⁵ The satellite is currently part of a program that is tracking several key environmental indicators in the Slave River Delta from space to assess potential threats, such as changes in water temperature, heavy river ice build-up, weak or thin ice, changing river courses, and sediment flowing into the river.⁴⁶

Canada enjoys a wealth of intellectual talent and capital, with influential water scientists, institutions, and professional networks, and a legacy of internationally-acclaimed collaborative research institutes, such as the International Institute for Sustainable Development's Experimental Lakes Area.⁴⁷ Canada's testbed infrastructure and new technology demonstration facilities have not only allowed for the quick fabrication of scalable models through additive layer manufacturing (i.e. 3D printing, etc.), but also the commercialization of new technologies.⁴⁸

Model,"

http://www.kz.undp.org/content/kazakhstan/en/home/operations/projects/environment_and_energy/joint-eu-undp-unece-project-supporting-kazakhstans-transition-to.html.

⁴⁰ The Conference Board of Canada, "Water Quality Index," 2016, <http://www.conferenceboard.ca/hcp/details/environment/water-quality-index.aspx>.

⁴¹ The Cleantech Group, http://info.cleantech.com/GlobalCleantech100_2012Report.html.

⁴² The Artemis Project Top 50 Water Tech Listing, <http://artemistop50.com/>.

⁴³ Integrated Sustainability, <http://www.integratedsustainability.ca/>.

⁴⁴ Ostara, <http://ostara.com/>.

⁴⁵ Canadian Space Agency, "RADARSAT-2," <http://www.asc-csa.gc.ca/eng/satellites/radarsat2/default.asp>.

⁴⁶ Canadian Space Agency, "A new water management program using RADARSAT-2," February 9, 2016, <http://www.asc-csa.gc.ca/eng/blog/2016/02/09/a-new-water-management-program-using-radarsat-2.asp>.

⁴⁷ International Institute for Sustainable Development Experimental Lakes Area, <https://www.iisd.org/ela/>.

⁴⁸ David Crane, "Canada as the Water Solutions Country: Defining the Opportunities," *Canadian Water Network*

All across the country, governments, companies, watershed agencies, NGOs and community organizations are all working to accrue data, share best practices, raise awareness, enrich water policy, and report to the public on the health of water bodies.

Over time, the Government of Canada has allocated millions to strengthen local water networks and partnerships and this has been supplemented with investments made by the private sector. For example, in 2011, IBM pledged CAD \$20 million to the Southern Ontario Water Consortium to support the development of partnerships with eight universities and over 70 companies with the aim of generating a new platform for innovation in watershed, wastewater and drinking water management.⁴⁹ Recently, Manitoba's Rural Municipality of Bifrost-Riverton's Agricultural Sustainability Community Service Cooperative Inc. also received funding to undergo innovative field research to address water-related issues affecting local agricultural producers.⁵⁰ The project will identify alternative crops that may be suitable with improved water management, ways to mitigate soil erosion and maintain water quality on agricultural land, and rehabilitating municipal drainage.⁵¹

In Canada, water management priorities and responsibilities are shared between the

federal, provincial/territorial, and municipal governments.⁵² Today, governments at all levels in the country are shifting towards utilizing water management approaches that are rooted in sustainable development principles and develop healthier ecosystems and watersheds.⁵³ In 2010, the leaders of the provinces and territories adopted a Water Charter, set up a Water Stewardship Council, and enacted a Water Partner Advisory Committee to buttress and advance water research, the development of water technologies and services, water conservation, and quality standards.⁵⁴ The federal government has also recently delivered its new budget with significant money earmarked for cleantech development, innovation, and water governance.⁵⁵ In fact, Canada will launch a Clean Water and Wastewater Fund for provinces, territories, and municipalities.⁵⁶ An investment of CAD \$2 billion over four years is being made for enhancements to water supply and treatment infrastructure.⁵⁷

While many provinces in Canada have adopted ambitious water strategies and established relevant ministries, Ontario is a clear leader. The Ontario government's water legislation and strategies, such as the Water Sector Strategy,⁵⁸ has helped to develop collaborative partnerships to accelerate water innovation and grow a fertile environment where the water industry could thrive.⁵⁹ As a

(May 2013): Pg. 18, <http://www.cwn-rce.ca/assets/resources/pdf/Blue-Economy-Initiative/BEI-Water-Solns-report-EN-web.pdf?u=>.

⁴⁹ FedDev Ontario, "Government of Canada Invests in Clean Water Technology," August 23, 2011, <http://www.feddevontario.gc.ca/eic/site/723.nsf/eng/00598.html>.

⁵⁰ Government of Canada Newsroom, "Canada and Manitoba Invest in Water Management Solutions for the Rural Municipality of Bifrost-Riverton," July 4, 2016, <http://news.gc.ca/web/article-en.do?nid=1093869>.

⁵¹ Ibid.

⁵² Environment and Climate Change Canada, "Water Governance and Legislation: Shared Responsibility," <https://www.ec.gc.ca/eau-water/default.asp?lang=En&n=035F6173-1>.

⁵³ Environment and Climate Change Canada, "Water Management," <https://www.ec.gc.ca/eau-water/default.asp?lang=En&n=DF9EE875-1>.

⁵⁴ Canada's Premiers, "Water Stewardship Council," <http://www.pmprovinceterritoires.ca/en/initiatives/47-water-stewardship-council>.

⁵⁵ Government of Canada – Budget 2016, "Chapter 4 – A Clean Growth Economy," <http://www.budget.gc.ca/2016/docs/plan/ch4-en.html>.

⁵⁶ Government of Canada – Budget 2016, "Chapter 2 – Growth for the Middle Class," <http://www.budget.gc.ca/2016/docs/plan/ch2-en.html>.

⁵⁷ Ibid.

⁵⁸ Government of Ontario, "Ontario's Water Sector Strategy," 2013, http://www.watertapontario.com/a/brochures/20130523230443_waterstrategyen.pdf.

⁵⁹ Brian Mergelas, "Destination: Ontario – The World's 'Water Hub'," *OWWA Ontario Pipeline* 9(1): 2013, Pgs. 32-33, <http://www.owwa.ca/wp-content/uploads/2012/12/Spring-2013-Pipeline.pdf>.

result, today, Ontario is a world-leading water hub. The province has a strong track record in producing water-related patents; outpacing comparable international government jurisdictions in the past 30 years.⁶⁰ The province's water sector abodes 900 thriving water-oriented companies, such as GE Water/ZENON and Trojan Technologies, that have produced world-class innovations in water treatment technology.⁶¹

Ontario boasts a wide array of research establishments with substantial water management expertise. WaterTAP is a project aimed at supporting the province's status as a world-class water technology hub.⁶² Based in Hamilton, the United Nations University-Institute for Water, Environment and Health serves as the UN's knowledge hub on water.⁶³ The National Water Research Institute in Burlington is the country's largest freshwater science organization.⁶⁴ The Water Institute, housed at the University of Waterloo, is an international leader in water research.⁶⁵ Oakville's BLOOM Centre for Sustainability provides assistance and guidance with eco-business practices, including water resource management.⁶⁶

LINKING CANADIAN WATER EXPERTISE TO KAZAKHSTAN

Reflecting its history as a water nation, as well as its long-time role as a strong contributor to and promoter of international development, Canada possesses the capacity to enhance water security in Kazakhstan. Introducing Canadian water strengths, assets, and capabilities will undoubtedly help Kazakhstan

improve water management across the country. Canada can succeed by supporting efforts to mobilize water knowledge and innovation, develop water law and policy, build water-sustainable communities and economies through public-private sector collaboration, grow a collaborative freshwater community, enhance transboundary water cooperation through mediation, and augmenting Canadian hydro-diplomacy.

Mobilizing water knowledge and innovation

Canadian research and expertise will be critical to advancing Kazakhstan's national water agenda and can drive bilateral collaboration across governments and non-governmental groups. In particular, a strong knowledge base accessible in academic and research institutions across Canada can advance science and technology to fashion innovative solutions, as well as deliver evidence-focused data required for effective water-related policymaking in Kazakhstan. Cross-border university research partnerships are important. There could be a development of a Clean Water Group, linking the University of Toronto, the University of Waterloo, Al-Farabi Kazakh National University, and the German-Kazakh University in Almaty focused on devising solutions to Kazakhstan's water treatment and distribution challenges and envisaging ways through which the country can ensure future water needs and compliance. Two aforementioned examples of Canadian water leadership, the Southern Ontario Water Consortium and the United Nations University Institute for Water, Environment and Health at McMaster University, which are both respectively

⁶⁰ "Ontario Named an International Water Industry Leader," *Water Canada*, May 12, 2014, <http://watercanada.net/2014/ontario-named-an-international-water-industry-leader/>.

⁶¹ Ibid.

⁶² WaterTAP Technology Acceleration Project, <http://www.watertapontario.com/>.

⁶³ UNU-INWEH, <http://inweh.unu.edu/>.

⁶⁴ Environment and Climate Change Canada, "Environmental Science Centres – Ontario,"

<https://ec.gc.ca/scitech/default.asp?lang=En&n=0B9A6436-1>.

⁶⁵ University of Waterloo Water Institute, <https://uwaterloo.ca/water-institute/>.

⁶⁶ "Ontario's Craft Brewers Get Serious About Sustainable Water Management Solutions," *Water Canada*, January 19, 2016, <http://watercanada.net/2016/ontarios-craft-brewers-get-serious-about-sustainable-water-management-solutions/>.

working to resolve the global water crisis, can support capacity development in Kazakhstan, as well as research and policy development.⁶⁷ Canada can work with the Federation of Canadian Municipalities to send experts to Kazakhstan to share Canadian experiences and disseminate new knowledge on municipal water management. Tapping into the Canadian Water Network, the national water innovation hub, can also be the key to foster water research and form a collaboration with relevant institutions in Kazakhstan. Such a collaboration represents an enormous opportunity for Canada in helping to establish water clusters in Kazakhstan by first training local water experts and organizations that are able to respond to local water challenges, particularly emergencies, as well as broadly investing in the education of future Kazakhstani engineers and technicians. In helping to launch the foundation for thriving water clusters, Canada will enable Kazakhstan to later support and foster strategic partnerships to encourage water resource management while improving economic development and environmental and health protection.

Water law and policy

Canada has produced a number of water commitments; launching new strategies and passing new legislation to respond to modern day and future challenges. Canada has the skill and capability to support Kazakhstan in developing a national multidimensional water-use strategy, that specifically takes into consideration the country's agricultural and energy needs, with the aims of protecting water resources, updating water supply infrastructure, and implementing water-efficient technologies and methods. This strategy could be part of a broader plan for adapting to climate change and can serve to supplement Kazakhstan's transition to the

UNDP-led integrated water management framework.

Specific measures can be introduced as part of the national water-use strategy, including "dam and reservoir construction, groundwater abstraction, pumping stations construction, river flow regulation, fresh water alternative sources development, [and] maximum water loss reduction."⁶⁸ Establishing benchmarks and standards for the protection of water quality as part of the strategy can help stimulate innovation in water conservation and treatment while ensuring hydrological and ecological security. In assisting to conceptualize this strategy, Canada can encourage Kazakhstani officials in employing the laws and policies that recognize 'the right to water,' which would be a positive step in ensuring greater water access and enhancing human well-being.

To this effect, Canada should support efforts made by Kazakhstan to improve water governance at all levels, particularly the drafting and implementation of effective monitoring mechanisms. Furthermore, this could mean helping to build the capacity of Kazakhstan's Committee on Water Resources through such initiatives as investing in their resource needs, as well as setting up a decentralized, cross-sectoral coordination mechanism with other state agencies involved in water management.

Canada must also motivate Kazakhstan to ratify the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses.⁶⁹ None of the Central Asian states, with the exception of Uzbekistan, have ratified the pact. The UN Watercourses Convention reflects "customary international water law, such as the equitable and reasonable use and no significant harm rule" and is tied together with "procedural

⁶⁷ David Crane, "Canada as the Water Solutions Country: Defining the Opportunities," *Canadian Water Network* (May 2013): Pgs. 19, 35, <http://www.cwn-rce.ca/assets/resources/pdf/Blue-Economy-Initiative/BEI-Water-Solns-report-EN-web.pdf?u=>.

⁶⁸ Ibid.

⁶⁹ United Nations General Assembly, *Convention on the Law of the Non-Navigational Uses of International Watercourses*, Resolution adopted by the General Assembly, Fifty-first session, Agenda item 144, A/RES/51/229. May 21, 1997.

obligations to cooperate, exchange information, and notify.”⁷⁰ The Convention itself could also abet the enactment of sub-regional water agreements; contributing to greater understanding, cooperation and security in Central Asia.

Building water-sustainable communities and economies through private-public sector collaboration

Canada has been a leader in water conservation and productivity, wastewater treatment, and is shifting to pioneering, green infrastructure that is adding to public value. Canada’s water technology, resource management services, and clusters are among the world’s frontrunners. For example, many Canadian companies are making attempts to turn large amounts of earth’s water which are unusable – seawater, wastewater, polluted water – into something that is safe for use. Kazakhstan can benefit from Canada’s water purification and water treatment technological developments and Canada’s expertise in rectifying maintenance issues and the inefficiencies of the current water system and related infrastructure projects by ensuring the proper implementation of the country’s Integrated Water Resources Management Plan.

In the past, Canadian governments and companies have supported Central Asia’s water management needs. In fact, in 1999, together with the Basin Water Organization ‘Syrdarya’ and the Scientific-Information Centre of the Interstate Commission for Water Coordination in Central Asia, a Canadian company based in Calgary, UMA Engineering

Ltd., with assistance from the Canadian International Development Agency, assembled a computerized monitoring and control system for the headworks of the Dustlik canal, which distributes water for irrigation in Kazakhstan and Uzbekistan.⁷¹

Canada’s competitive water companies are providing good and services to world markets that are aimed at minimizing water leakage, maximizing efficiency, and clean up contamination. Canada’s companies possess “world-class membrane technologies, ultraviolet water treatment systems, remediation systems, technologies to extract nutrients from municipal and high-strength industrial wastewater [i.e. the anaerobic treatment of sludge] ...treatment of biosolids generated in the waste-water treatment process, [and] desalination techniques for purifying sea water, brackish water, and waste water.”⁷² Canadian consulting companies and engineering firms are adept in designing, engineering, building and operating water projects. Canadian water companies also retain competitive expertise in contributing valuable water analysis, assembling water-related infrastructure, and fabricating water information systems and software.

Kazakhstan must discover ways to fix its gap in water infrastructure and this will necessitate substantial investment in revamping existing infrastructure, leak detection, on-site pipe restoration and improving water treatment facilities.⁷³ Canadian industrial companies could produce pipes, pumps, and valves that can be used in Kazakhstan’s water delivery

⁷⁰ Dinara Ziganshina, “International Water Law in Central Asia: Commitments, Compliance and Beyond,” *The Journal of Water Law* 20 (2009): Pg. 104, <http://www.unwatercoursesconvention.org/images/2012/10/International-water-law-in-Central-Asia.pdf>.

⁷¹ Canadian Consulting Engineer, “Aral Sea Irrigation Control and Automation Program,” October 1, 1999, <http://www.canadianconsultingengineer.com/features/aral-sea-irrigation-control-and-automation-program/>.

⁷² David Crane, “Canada as the Water Solutions Country: Defining the Opportunities,” *Canadian Water Network* (May 2013): Pgs. 8, 32, <http://www.cwn-rce.ca/assets/resources/pdf/Blue-Economy-Initiative/BEI-Water-Solns-report-EN-web.pdf?u=>.

⁷³ Harriet Bigas, *The Global Water Crisis: Addressing an Urgent Security Issue*, Papers for the InterAction Council, 2011-2012, Hamilton: UNU-INWEH, Pg. 61, http://inweh.unu.edu/wp-content/uploads/2013/05/WaterSecurity_The-Global-Water-Crisis.pdf.

systems and, therefore, should develop linkages with relevant authorities to seek out the best opportunities for business involvement.

Export Development Canada, the country's export credit agency, should support interested Canadian businesses in providing insurance and financial products and services that they might need to enter Central Asian markets, particularly Kazakhstan.

Supporting a collaborative freshwater community

Canada can play a key role in assisting Kazakhstan to balance between its economic growth and environmental rehabilitation efforts. Projects and programs, including community-based water observation and general public outreach and education, are important assets in realizing a sustainable water future. While calling on Kazakhstan's government to build up water education programs, Canada, through the establishment of a grant program, can support Kazakhstan's non-governmental organizations in implementing water-saving schemes in oblasts that are greatest in need. Canada's development and aid programs on water and sanitation can also create opportunities for Canadian for-profit and not-for-profit organizations, such as the Aga Khan Foundation of Canada, that work in Kazakhstan. One project of focus for Canadian NGOs should be training on the use of sustainable, water-saving agricultural practices, as well as helping to restructure irrigated cultivated areas. Reforms, such as a switch over from high water intake crops, like cotton, to crops that are less water-intensive should be explored.

Furthermore, in order to address climate change issues, Canada should help Kazakhstan solicit the assistance of the Kyoto Protocol's Clean Development Mechanism

and other global climate finance funds through the World Bank and related organizations.

Canada should fortify the involvement of civil society in both articulating and formulating plans for regional water cooperation. Canada should go even further to call on the government to make such consultations a formal requirement. The invitation of civil society representatives, ranging from NGOs to Water Users' Associations, to attend and contribute to joint committee and council meetings can provide a much needed voice to water management stakeholders in the country. In an effort to fold more stakeholders and the public into key water discussions, it would be wise for Canada to support the implementation of water forums at which water experts, policy officers, and government officials debate on the future of Kazakhstan's water resources with the objectives of ensuring that water management remains a priority for the government, as well as understanding more clearly where in the country Canada can play a greater role.

Given the varying effectiveness of organizations such as the ICWC, the Interstate Coordination Water Commission in the Aral Sea Basin, and the International Fund for the Aral Sea, Canada should encourage Kazakhstan and other Central Asian states to develop a just and fair water sharing agreement. Ideally, such an agreement should provide an opportunity for discussion, consultation, as well as comprehensive decision-making and dispute-resolution mechanisms in water resources management, recognized by all parties, and collaboration in water quality maintenance.⁷⁴ The main approach to enhance the capacity of relevant regional water oversight institutions should shift from merely "technical areas towards broader socio-economic and environmental challenges, which are very much needed given the complexity of the hydrological situation of the region."⁷⁵ Not only this but

⁷⁴ Beatrice Mosello, "Water in Central Asia: A Prospect of Conflict or Cooperation?," *Journal of Public and International Affairs* 19 (2008): Pg. 164,

<https://www.princeton.edu/jpia/past-issues-1/2008/9.pdf>.

⁷⁵ Ibid, Pg. 165.

providing the organizations with a greater degree of autonomy over technical, administrative and financial decisions can make them much more effective in producing results while looking beyond competing national interests.

Models of effective capacity building that have been carried out in other international river basins, especially from Africa and Latin America, would be valuable in demonstrating how to achieve a similar result in the Central Asian context.

Transboundary water cooperation through mediation

Trans-boundary water concerns in Kazakhstan are important given that nearly half of the country's water pours in from neighboring republics and, so, if tensions surrounding water scarcity are not systematically dealt with soon, they could eventually pose a detrimental risk to the future development of the country and region.

In a spirit of understanding and compromise, Canada should aim to instill the idea that the sharing of water resources should not be considered a zero-sum game, which has largely been the reigning perception of states and has hampered progress, but rather cooperation can result in the expansion of economic and social benefits for all parties. As minimal action has been undertaken by the international community on this issue, Canada can lead by helping Central Asian states find common ground among competing national interests of upstream and downstream countries through effective dialogue. To start, Canada should help Kazakhstan's government update the 1992 Almaty Agreement with the goal of increasing its utility. Currently, the document is out-of-date and has been ineffective in guaranteeing an even-handed provision of water to Central

Asian states. Cooperative agreements such as the Chu-Talas Basin agreement between Kazakhstan and Kyrgyzstan is a successful example that permits equitable water sharing and inter-state use of hydrological facilities.⁷⁶

Canada understands that regional cooperation is indispensable in constructing working transboundary relationships that can yield optimal water levels, as well as food and health security for local water users. Canada has carefully anticipated, prevented and resolved water disputes with the United States through the International Joint Commission and the country's participation in the Great Lakes Commission. Canada's Northwest Territories 'Northern Waters, Northern Voices' transboundary water stewardship strategy also shows how to balance between human and hydrological needs.⁷⁷

With its experience, Canada should stand ready to contribute to initiatives that build confidence and help restore trust in the region. Canada can act as a mediator to help Kazakhstan and its neighboring countries develop appropriate regional water policies that incorporate water, food, and energy within Central Asia's security context. It is recommended that Canada encourage Kazakhstan and other Central Asian states to harmonize and coordinate legislation and policies, as well as promote an interchange of research and information. Several regional programs can be introduced that work towards these objectives, including training in integrated water resource management and jointly gathering data. Canada should also press the Central Asian republics to prioritize funding for their respective water management organizations that are in charge of water monitoring, watershed management, data exchange, etc.

⁷⁶ 76 UNESCO, "Chu-Talas Basin (Kyrgyz Republic, Kazakhstan): Bilateral agreements in the face of changing geopolitics," http://webworld.unesco.org/water/wwap/pccp/zaragoza/basins/chu_talas/index.shtml.

⁷⁷ Government of Northwest Territories, "Northern Voices, Northern Waters: NWT Water Stewardship Strategy," May 2010, http://www.enr.gov.nt.ca/sites/default/files/strategies/nwt_water_stewardship_strategy.pdf.

In working with Kazakhstan and its neighbors, Canada must also ensure that broader principles of environmental sustainability are incorporated into transboundary water discussions and statements, including but not limited to: integration of surface and groundwater interactions (i.e. transboundary aquifers) with water management; protection of ecosystems; public and private sector participation; co-operative, multi-level governance; as well as the need for adaptability and flexibility in the management of shared waters. Canada may consider supporting necessary hydroclimate monitoring and mapping in Kazakhstan as well.

Canadian hydro-diplomacy

Currently, oil, gas and mining interests occupy a considerable space in Canada-Kazakhstan relations, but water must feature more prominently on the joint political agenda. In order to do this, Canada will need to engage with key water leaders and stakeholders in Kazakhstan and Central Asia while forming a dialogue with counterparts in government. In so doing, Canada would be able to play a crucial role in ensuring political and economic stability in the region, while safeguarding long-term Canadian interests.

Canada's Embassy in Kazakhstan can promote the role of Canada's water sector, connecting researchers and experts in both countries with the aim of conceiving new ways to ensure safe drinking water and water conservation, as well as establish partnerships to enable Canadian companies to contribute technology and training in the country. The latter can be done by setting up business meetings and trade missions between relevant Canadian water companies and local governments and businesses.

On the whole, Canada must do more to market itself as a strong and capable investment destination for Kazakhstan's government and companies that are in need of water expertise and reliable supplies of sustainably-managed, clean water. To further this objective, "Canada Water" could establish

offices in target markets like Kazakhstan and be responsible for identifying opportunities and marketing.

CONCLUSION

In the seminal novel *Water: The Epic Struggle for Wealth, Power, and Civilization*, Steven Solomon observes the growth and decline of hydraulic societies through history. In doing so, Solomon validates that water assets are essential for the progress of strong sovereign states. This certainly holds true in Central Asia today, where shortages in water resources are now more than ever understood as being extremely crucial for human, economic and societal development. Water has contributed to agricultural production, industry, the growth of cities and overall well-being. However, ineffective water management and use, together with changes in climate and water variability, have altogether severely impacted both the region's upstream and downstream countries, particularly Kazakhstan.

When Kazakhstani President Nursultan Nazarbayev launched the Kazakhstan 2050 Strategy in 2012, he acknowledged that water scarcity is a key global challenge, with a special salience for landlocked Kazakhstan. The country grapples with porous water infrastructure and managements systems. Under-staffed and under-resourced state water oversight organizations make it increasingly challenging to tackle water issues. In some regions, particularly rural areas, there is still a poor quality of drinking water. Water levels of Central Asia's two major rivers are decreasing; harming the crop yields, especially water-intensive crops like cotton and rice, in Kazakhstan and other downstream republics. Cooperation among the republics also remains minimal; hindering cooperation on transboundary water issues. If left unchecked, the current state of water management and usage in Kazakhstan together with climate change could lead to instability in the country, and most certainly in broader Central Asia.

Canada, being a steward to one of the world's most extensive freshwater supplies and home to some of the world's strongest intellectual capital, is well suited to deliver water solutions required by Kazakhstan. Canada continues to develop itself as an international innovation leader; consistently generating new and improved water technologies, facilities, projects, techniques and clusters. Introducing Canadian water strengths, assets, and capabilities in Kazakhstan will undoubtedly help the country improve water management across the country. Canada can succeed by supporting Kazakhstan's efforts by mobilizing water knowledge and innovation, developing water law and policy, building water-sustainable communities and economies through private-public sector collaboration, growing a collaborative freshwater community, enhancing transboundary water cooperation through mediation, and augmenting Canadian hydro-diplomacy. In these ways, Canada will be able to comprehensively instill a fundamental water ethic in Kazakhstan, focused on broader principles of appropriate

human conduct with respect to water and the environment. In view of the serious health, economic, environmental and general developmental impacts, water scarcity and degradation in Kazakhstan are all too serious issues that cannot afford delayed action. Genuine political will must first be in place and then financial commitments, integrated horizontal cooperation, and public education on sustainability must follow. Kazakhstan possesses both the affluence and the will to spawn regulatory and policy changes that will bring about the necessary advancements.

Kazakhstan has big dreams, economically and politically, as befitting a large country, and Canada can certainly help bring these to fruition. With every drop counting, safeguarding water assets as part of a Canada-Kazakhstan water partnership will undoubtedly lay the strong foundation needed for robust economic growth and development; securing Kazakhstan's place in Central Asia as a strong, sustainable and productive nation.

BIO

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Years of passionate engagement in social issues have taken Aaron from the crèches of post-Apartheid townships in Cape Town to the polling stations of Ukraine all the way to the hilltop villages in Eastern Colombia. His avid interest in global affairs led to his selection as a Junior Team Canada ambassador on trade and development missions to Latin America and the Canadian Arctic.

Aaron founded the Canadian Youth Think Tank, the first knowledge hub of its kind in Canada that strives to inspire greater involvement of young people in civic life. He was elected as a City Youth Councillor in his hometown of Mississauga, and was also appointed as Canada's Youth Ambassador to the OSCE.

In the past, Aaron worked at the Parliament of Canada reporting to the Secretary of the Minister of Foreign Affairs. He also worked at the Commercial Affairs division at the U.S. Consulate in Toronto.

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