1. **Background**

The Colorado River is a 1,450 miles-long water body that crosses seven states in the U.S., Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming, and two in Mexico, Baja California and Sonora. In the early 1960s the salinity levels of the Colorado River rose from 800 parts per million (ppm) to 2700 ppm. This lead to a conflict between the U.S. and Mexico that lasted over a decade before reaching a “permanent and definitive solution” to the salinity problem of the Colorado River, as claimed by Minute 242 – Permanent and Definitive Solution to the International problem of the salinity of the Colorado River.

In order to understand the origin of the dispute and the interests that both countries had we have to go back to the beginning of the 20th century when the Imperial Valley in Southern California and the Mexicali Valley, a continuation of the Imperial Valley in the Northeast of Baja California, underwent significant development. In Mexico, the development of the Mexicali Valley was a natural consequence of the agricultural development of the Imperial Valley in California. Specifically, the Mexican government’s award of a concession to the Colorado River Company (an American firm) incentivized the economic growth of the region through the development of irrigation facilities and the expansion of the production of cotton. Other factors contributed to further incentivize the growth of the region. For example, the annual allocation of 1.5 million acre feet of Colorado River Water established in the 1944 Water Treaty between Mexico and the United States expanded agriculture, while cotton prices were in the midst of a boom in the international market. By the mid-1950s, the Mexicali Valley was the leading cotton-production region in the country, and by the 1960s the Mexicali Valley had become one of the most important regions to the overall Mexican economy.[[1]](#endnote-1)

Meanwhile in the U.S., the Wellton-Mohawk Valley area in Arizona started its development in the 1880s. This was a fertile region due to the presence of the Gila River. Yet, events such as the diversion of flows to other areas or the construction of the Roosevelt Dam on the Salt River (the Gila’s primary tributary) reduced the flow of the Gila River, rendering it necessary to use ground water for irrigation purposes.[[2]](#endnote-2) The Wellton-Mohawk valley’s location and lack of outlet for drainage had a negative impact in the water by increasing the salinity levels considerably. This led first to a fall in crop yields subsequently a drop in property values in the region. In the 1950s, the federal government determined to supply water from the Colorado River. Although initially successful, this proved to be a temporary fix rather than a permanent solution. Once again, inadequate drainage in the region resulted in a rise of the water table. The solution given was to construct wells, pump out the briny waters and substitute the saline water with fresh resources from the Colorado River. Finally, in 1961, the Wellton-Mohawk Irrigation project, a 50-mile-long channel was completed and used to transport the highly saline waters into the Colorado River, south of its confluence with the Gila River. These saline waters then began flowing into Mexico by the end of that year.[[3]](#endnote-3) Moreover, during that year, upstream releases, that could have diluted the waters from the Wellton-Mohawk, decreased considerably in order to fill Lake Powell behind the new Glen Canyon Dam.[[4]](#endnote-4)

1. **The Conflict**

By the end of 1961, the salinity levels of the Colorado River almost quadrupled from 800 ppm to 2700 ppm making the waters unsuitable for human consumption and irrigation. Mexico had no choice but to let those waters flow into the Gulf of California, resulting in significant crop losses. Subsequently, Mexico accused the United States of breaching the 1944 Water Treaty between them. In response to these accusations the United States argued they had no obligation with respect to the quality of water. Nonetheless, the U.S. agreed to send fresh water to Mexico. From the U.S. perspective this was a mere act of kindness and should not be interpreted as a precedent.[[5]](#endnote-5)

In 1944, Mexico and the United States signed the treaty for the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande from Fort Quitman, Texas to the Gulf of Mexico (hereon known as the 1944 Water Treaty). Under Article 10, Mexico was allotted 1.5 acre-feet per year. This amount could be increased in an amount determined by the United States in case of excess water, but would not exceed 1.7 acre-feet a year.[[6]](#endnote-6)

The position of the U.S. rested in the literal interpretation of the 1944 Treaty Water; whereas Mexico interpreted the Treaty in a more holistic way. The U.S. argued the Treaty was silent on its obligations regarding water quality. Mexico sustained water quality was implicit under Article 3, which specifies its uses.[[7]](#endnote-7) This article establishes the International Boundary and Water Commission’s (IBWC) authority to preside over the joint use of international waters on matters such as “Domestic and municipal uses. Agricultural and stock-raising... Fishing and hunting and any other uses which may be determined by the Commission.”[[8]](#endnote-8)

1. **The Stakeholders**
* United States of America – Federal Government
* Department of State
* Department of Interior - Bureau of Reclamation
* The Committee of Fourteen which represents the Seven Basin States – Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming. The Basin States did not take direct part in the negotiation process. Yet, congressmen of the seven states lobbied the State and Interior Departments.[[9]](#endnote-9)
* The Wellton-Mohawk Irrigation and Drainage District in Arizona. Created by an act of the Arizona State Legislature in 1951, the District provides a legal entity to contract with the United States to repay the cost of the Welton-Mohawk irrigation and drainage projects, and to operate the project facilities.[[10]](#endnote-10)
* Mexico – Federal Government (Under Article 73, XVII of the Federal Constitution of Mexico, Congress has the power to enact laws regarding the use and utilization of waters under federal jurisdiction).[[11]](#endnote-11)
* Ministry of Foreign Relations
* Ministry of Interior
1. **What did they do to resolve the Conflict?**

The negotiations between the U.S. and Mexico to solve the salinity of the Colorado River kept going on for a decade before reaching a final solution in 1973. The negotiation process resulted in three minutes issued by the IBWC, Minute 218 in 1965, Minute 241 in 1972 and Minute 242 in 1973.

Despite the U.S. maintaining that they had no obligation to a particular standard of water quality under the 1944 Water Treaty, they agreed to enter negotiations with Mexico in 1962. Among the factors inducing the U.S. to join negotiations were the aversion to facing a case brought by Mexico at the International Court of Justice, and the U.S.’s desire to establish friendlier relations with its southern neighbors.

The U.S. law firm Chapman and Friedman, retained by the Mexican government, concluded the U.S. could be held responsible under customary international law for the damages caused by the high salinity levels in the Colorado River. Still, the firm advised Mexico to seek a diplomatic solution rather than going to court.[[12]](#endnote-12) Moreover, it seems possible that the logic behind the U.S. decision to allocate an annual 1.5 allotment of Colorado River water to Mexico established in the 1944 Water Treaty was a the result of the U.S. interest in fostering relations with neighboring countries during and after World War II. Likewise, the negotiation process that resulted in Minutes 218, 241 and 242 could have followed a similar pattern and be a result of the interest from the United States to cultivate better relations with Latin America.[[13]](#endnote-13) In support to this argument, leftist and Communists groups had gained strength in the Mexicali region and had focused their attacks both in the U.S. and Mexican governments.[[14]](#endnote-14) It seems likely that the U.S. would have had a particular interest to minimize and contain the rise of Communists groups south from its border and cooperating with Mexico was a way to undermine the progress of these groups.

An initial recommendation from the Department of Interior urged both countries to adopt remedial measures to address the conflict. It also underscored Mexico had faced salinity problems even before the Wellton-Mohawk project was finished, mainly due to agricultural overexpansion in the Colorado Delta. The Bureau of Reclamation suggested the implementation of measures and river regulation plans that would reduce the peak salinity concentrations of water delivered to about 1800 ppm. Mexico refused this first approach for the salinity levels were still be high enough to damage crop yields.[[15]](#endnote-15)

In 1965, the parties agreed on a five-year agreement Minute No. 218 - *Recommendations on the Colorado River Salinity Problem*. According to the Minute, the United States would construct at its expense a 13-mile channel which would prevent Wellton-Mohawk drainage waters from reaching Mexico’s diversion facilities at the Morelos Dam and instead flow directly to the Gulf of California. Furthermore, these provisions would not constitute any precedent, recognition, or acceptance affecting the rights of either country.[[16]](#endnote-16)

 In 1972, Minute No. 241- *Recommendations to Improve Immediately the Quality of Colorado River Waters going to Mexico* was signed after the U.S. and Mexico’s Governments issued a Joint Communique. This document reflected a mutual interest in finding a solution to the salinity problem. According to the Minute, President Nixon was prepared to “a) undertake certain actions immediately to improve the quality of water going to Mexico; b) designate a special representative to begin work immediately to find a permanent, definitive and just solution of this problem; c) instruct the special representative to submit a report to him by the end of this year; d) submit this proposal, once it has the approval of this Government to President Echeverria for his consideration and approval.”[[17]](#endnote-17)

 Based on the instructions from both Governments the commissioners issued a series of recommendations. The new agreement determined the substitution of 118,000 acre-feet with equal volumes of other waters, to be discharged to the Colorado River above the Morelos Dam.[[18]](#endnote-18)

Nixon had appointed Herbert Brownell, former Attorney General of the United States as special representative. Finally, in 1973 the parties agreed to sign Minute No. 242 *Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River.* The resolution recognizes the United States obligation to deliver water under certain salinity level. No more than 115 ppm ± 30 ppm measured against the waters which feed the Imperial Dam salinity levels.[[19]](#endnote-19)

**What’s missing? What is under-addressed? What is the on-going issue? What issues are still not resolved fully?**

Minute 242, while overall a good outcome, is still insufficient. Considering it a permanent and definitive solution could be wishful thinking at best.

Probably, the greatest success in Minute 242 was the United States acknowledgement of its obligation to provide suitable waters for domestic and irrigation purposes to Mexico and the determination of what seems a reliable parameter, up to 115 ppm ± 30 ppm against the salinity levels in the Imperial Dam. Still, it is important to underscore some limitations to this document. Some of these limitations have been already identified. According to Furnish and Ladman (Furnish and Ladman, 1975), Minute 242 was unclear in the following issues. These are: 1) The salinity levels of the waters delivered to Mexico are still undefined. Water quality measured against the salinity in the Imperial Dam leaves room for uncertainty; 2) part of the waters delivered to Mexico are allocated to the San Luis Valley in Sonora. According to Minute 242, the salinity levels are the same as the waters ordinarily delivered. The water delivered at San Luis comes from the Yuma Valley Division and is a combination of ground water and return flow from the Yuma Mesa Division with high salinity levels, approximately 1700 ppm that are later mixed with waters of the Colorado River waters. Moreover, this document establishes that neither country should take any action for modification or developments of surface or groundwater resources without previous consultation; 3) Water supply as a consequence of the development of the Lower Basin States; 4) Responsibility for damages caused to Mexico although it establishes the improvement and rehabilitation of the Mexicali Valley; and 5) Potential alterations to the ecosystem in the Gulf of California as a consequence of increased salinity levels with potential damages to the fishing industry in the region.[[20]](#endnote-20)

How could these issues have been better addressed? As noted before Minute 242 establishes salinity levels could not exceed 115 ppm ± 30 ppm against the waters which arrive at the Imperial Dam. Yet, this parameter does not guarantee water quality in the Imperial Dam. What would happen if salinity levels in these waters increased to levels that make them unfit for Mexico? Probably a better solution for this could have been either to set certain limits to salinity levels or specify that Mexico could only accept water whose salinity levels were suitable for the specific crops in the region.

What does “…salinity substantially the same as that of the waters customarily delivered there” mean? Isn’t this language as ambiguous as the 1944 Water Treaty was at a time? If, as noted by Furnish and Ladman, 1975, the waters allocated to the San Luis Valley in Sonora are a mix of waters of ground water and return flow from the Yuma Mesa Division which has high salinity levels before getting mixed with the Colorado River waters, does the substantially same salinity refer to the salinity levels before the waters are mixed with the Colorado River waters or after they are mixed? Logic and good faith would suggest the latter, but the omission demands clarity. As for point 6 of the Minute, what does consultation “prior to undertaking any new development of either the surface or the groundwater resources, or undertaking substantial modifications of present developments, in its own territory in the border area that might adversely affect the other country”[[21]](#endnote-21) mean? Does consultation mean a mere notifications or the need of an express authorization from the other party? Can parties oppose the development of surface or ground water resources across their borders? How to determine what might or might not affect the other party?

Moreover, there are some other issues worth noticing in addition to the above mentioned. Minute 242 recognizes it has an obligation to deliver water of quality to Mexico, not only related to the salinity levels but in general terms, under Minute 242, the U.S. has acknowledged it has an obligation to deliver quality not just quantity. Minute 242 establishes that “It is understood that no radioactive material or nuclear wastes shall be discharged through this drain..”[[22]](#endnote-22) This is particularly relevant under the current circumstances. If the Government of the United States builds a wall between the two countries and as a consequence of the erection of it pollutes waters that are to be delivered to Mexico, the United States could potentially be violating its obligations to Mexico.

Moreover, probably the most pressing issue is climate change and how it could affect the Colorado River.

A recent study published by the Water Resources Research centers its analysis in the annual flow reductions in the Colorado River in the 2000-2014 period which represented 19.3% below the 1906-1999 average.[[23]](#endnote-23) Flow losses are a consequence of high temperatures and lack of precipitation, both direct consequences of climate change. But high temperatures will increase evaporation from water bodies and soils too. Though many of the consequences of climate change are still uncertain there is high confidence on the increase of temperatures.[[24]](#endnote-24) This study addresses the decrease of flow (quantity). Still, these same factors, high temperatures and lack of precipitation, could have a further negative impact by increasing the salinity levels in the Colorado River.

**Timeline - Salinity of the Colorado River Conflict between the U.S. and Mexico**

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| --- | --- |
| **Date** | **Event Description** |
| 1944 | Mexico and the U.S. signed the “Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande from Fort Quitman, Texas to the Gulf of Mexico” also known as the 1944 Treaty. |
| 1945 | Ratification of the “Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande from Fort Quitman, Texas to the Gulf of Mexico.”  |
| 1961 | The salinity levels of the Colorado River rose from 800 ppm to 2700 ppm. |
| 1962 | Negotiation process between the U.S. and Mexico to address the salinity crisis start.  |
| 1965 | The parties agreed on a five-year agreement Minute No. 218. The United States would construct at its expense an extension to the Wellton-Mohawk District’s drainage channel which would allow the discharge of the waters to the bed of the river above or below the Morelos Dam flowing directly to the Gulf of California. The U.S. insists it does not have any obligation regarding water quality.  |
| 1972 | Joint Communique issued by the Mexican and American governments, where the latter committed to: a) undertake certain actions immediately to improve the quality of water going to Mexico; b) designate a special representative to begin work immediately to find a permanent, definitive and just solution of this problem; c) instruct the special representative to submit a report to him by the end of this year; d) submit this proposal, once it has the approval of this Government to President Echeverria for his consideration and approval.  |
| 1972 |  The parties issue Minute No. 241 The new agreement determined the substitution of 118,000 acre-feet with equal volumes of other waters, to be discharged to the Colorado River above the Morelos Dam. |
| 1973 |  The parties issue Minute No. 242 The resolution recognizes the United States obligation to deliver water under certain salinity level. No more than 115 ppm ± 30 ppm measured against the waters which feed the Imperial Dam salinity levels. |
| 1974 | Passage of the legislation PL 93-320 that confirms the content of Minute 242. |

**Way Forward (Application of WDF) – how can they further improve the situation and create a more sustainable plan that creates additional value for all the stakeholders.**

Minute 242 is neither a “permanent” nor “definitive” solution to the salinity problem. Law is not and should never be static. Law evolves and adapts to reality as it unfolds. As mentioned before, climate change is one of the pressing issues in the global agenda. There are few certainties regarding climate change and plenty of unknowns. Yet, increase of the global temperatures is one thing we can be certain of. According to the Intergovernmental Panel on Climate Change (IPCC) report, each decade has proven to be warmer than the previous one, and the period from 1983 to 2012 was the warmest of the last 1400 years.[[25]](#endnote-25) Salinity levels have increased in regions where evaporation dominates, whereas other waters have become fresher as precipitation has augmented.[[26]](#endnote-26) For the case of the Colorado Basin, it appears the tendency is an increase in temperatures. Temperatures in the Upper Basin are currently 0.9 degrees Celsius above the 1896-1999 period.[[27]](#endnote-27)

All of this makes it is most likely that sooner than later the U.S. and Mexico will meet again to further negotiate, among other issues in the bilateral agenda, the salinity levels from the Colorado River waters. Further negotiations between the U.S. and Mexico could further benefit from an approach of the Water Diplomacy Framework (WDF). Minute 242 is a good starting point and certain aspects of the WDF approach can be traced in its content. A clear example is the parties approach to value creation where the U.S. committed to install a desalting plant to reduce the salinity of the Wellton-Mohawk drainage water or replacing 118,000 acre feet of water pumped out of Arizona’s Yuma Mesa and/or taken from above the imperial Dam. Moreover, other negotiations such as Minute 319 on the allocation and management of shared waters prove the U.S. and Mexico are capable of reaching mutual understanding and cooperation, and consequently mutual gains. The success in this negotiations can make us hope for further collaboration between the U.S. and Mexico.

Further negotiations should include other stakeholders aside from the Federal agencies of both governments. The presence of the Seven Basin States is crucial to get a better understanding of the state’s interests as well as to guarantee the implementation of any resolution, due to the power of states over water management. Their participation in the negotiation process of Minute 319 sets a precedent and it is likely that from now on they will take part in the bilateral negotiations between the U.S. and Mexico. NGOs also proved to be very useful in the negotiations towards Minute 319 so it would be expected to have them as interlocutors. The Wellton-Mohawk Irrigation and Drainage District in Arizona is another important stakeholder since it is an independent political entity which overviews irrigation works and water utilities. As for Mexico, representatives from the Ministry of Foreign Relations or the Ministry of Interior would be the main stakeholders. But its is possible that some other governmental agencies could be interested in joining a negotiation process such as the Ministry of Energy or Ministry of Economy to name two examples. As mentioned before, water is a federal matter and thus, the states of Baja California and Sonora would not have a direct participation in any process.

In this case joint fact finding and scenario planning could be particularly challenging. As mentioned before the current reference of 115 ppm ± 30 ppm against the waters which arrive at the Imperial Dam is still ambiguous. Ideally, the parties should determine a range for what is consider an acceptable salinity level for irrigation purposes considering the crops that are grown or have been grown in the Mexicali Valley region. Other challenges are related to climate change and its uncertain consequences. So far, we can be certain of an increase in temperature globally and an increase in temperature in the Upper Colorado Basin of 0.9 degrees Celsius. Such factors would potentially lead to evaporation and thus higher salinity levels in the Colorado River Waters. In addition to the decrease in water quality, the decrease in quantity is also looming. This is an issue that should be addressed once the negotiations for the renewal of Minute 319 start in December 2017.

Value creation will also be challenging in this case where quality or quantity could potentially be affected as a consequence of climate change. Still, it is almost certain that both parties will have to adapt to new circumstances. New policies and implementation of technologies have to be develop to mitigate climate change and to adapt to those changes already occurring, it is worth considering some ideas that were proposed before. In this context, the installation of additional desalting plants as well as considering the introduction of different crops that could be resistant to more saline water in both countries are options worth evaluating. Furthermore, it is relevant to determine if there are technologies available that could allow the capture of the water that is evaporating. If this is technologies are not available, could the parties start working on ways to develop such technologies? Is it possible to think in terms of relocation of people to reduce the demand of water?

Finally, it is clear that the panorama is both complex and uncertain and whatever decision is taken will be far from “permanent or definitive”, particularly due to the impact of climate change. All stakeholders involved will have to adopt a collaborative adaptive management (CAM) approach. This should imply the opportunity to revise decisions within a defined timeframe. It seems likely that there will be a phase of trial and error and everyone involved should be aware of this.

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