

The COVID-19 Pandemic and Solutions to Address the Lack of Potable Water Infrastructure on the Navajo Nation

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Introduction

The disproportionate high rates of COVID-19 on the Navajo Nation (Nation) has recently made headlines on the world stage and has brought to light the lack of in-home sanitation facilities and lack of potable water infrastructure coverage. The lack of this critical water infrastructure has been attributed as one of the primary reasons for the disproportionately high rates of COVID-19 cases on the Nation as many residents do not readily have access to the clean water needed for handwashing and other sanitary uses. The lack of potable water infrastructure coverage on the Nation has been a long-standing issue prior to the COVID-19 pandemic and is also one of the primary underlying causes for the multitude of issues that plague the Nation such as high-poverty levels, low socio-economic status, lack of jobs, and other non-COVID-19 health disparities.

Current Water Infrastructure

Figure 1 shows the known locations of approximately 4,100 homes that lack basic in-home potable water facilities on the

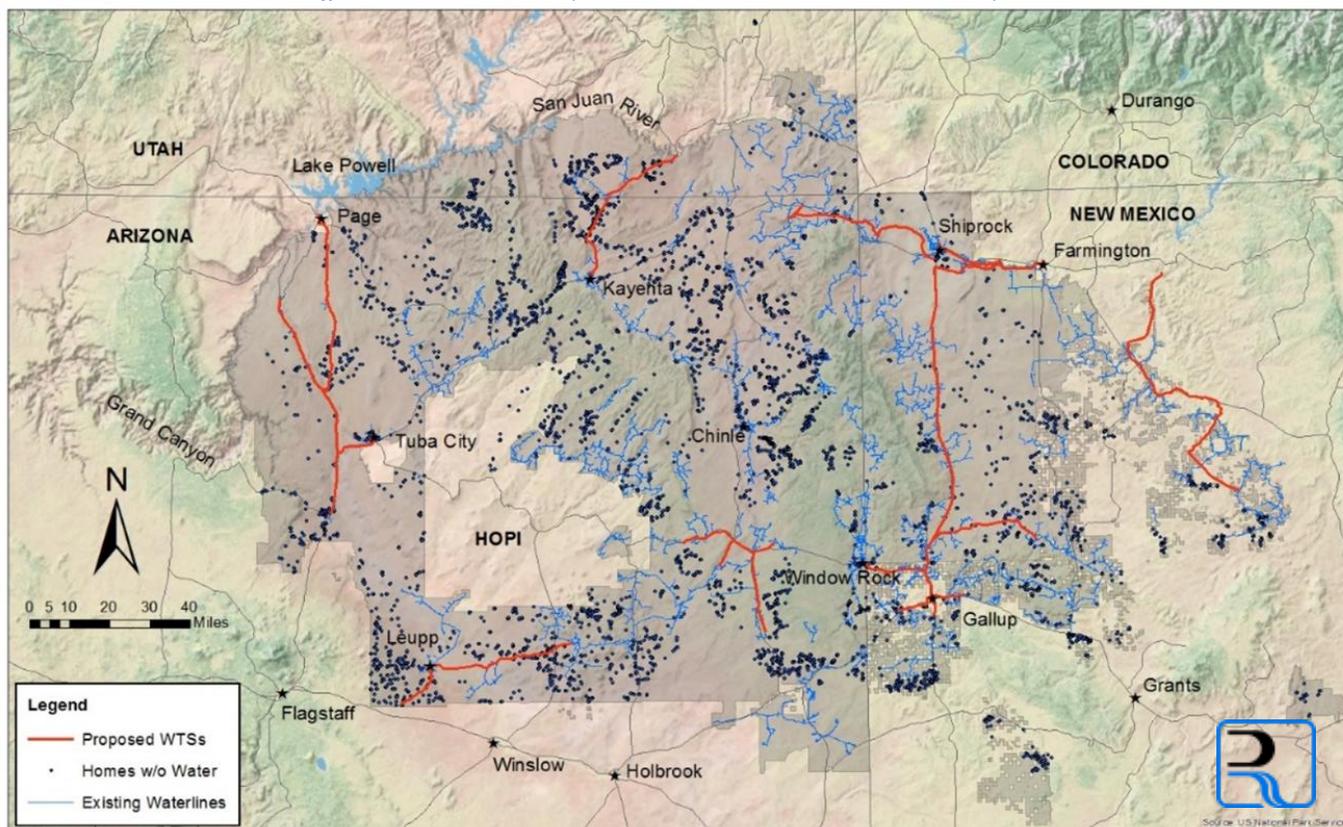
Nation but may not constitute all homes without water (home data provided by D. McDonnell, Indian Health Service, personal communication; July 21, 2015). Also depicted on Figure 1 is the existing Navajo Tribal Utility Authority (NTUA) water infrastructure coverage and proposed large-scale Water Transmission Systems (WTSs), some of which are currently under construction. The number of residences lacking adequate sewer facilities is even higher but are not shown. The homes shown are located beyond the extents of the water distribution existing systems.

The causes for the lack of potable water infrastructure is the result of deeper systemic issues which include (but are not discussed in detailed herein):

- A lack of available capital to invest in water infrastructure projects. Most funds are appropriated elsewhere to other socioeconomic improvement programs.
- A rural and sparsely distributed population density. The Nation is unable to take advantage of economies of scale for large capital infrastructure investments.
- A stifled economy as the result of minimal business development and slow economic growth. A lack of large businesses and industrial centers are not able to help in subsidizing utility costs.

For more information on the causes for the lack of potable water infrastructure, refer to Chee (2020).

Figure 1. Homes without potable water connections on the Navajo Nation



The Underlying Issues

Lack of a Sustainable Economy

The lack of a stable sustainable economy is the main cause for the water infrastructure deficiencies on the Nation. As an economy is dependent on a reliable potable water infrastructure to support it, sustainable water infrastructure is also dependent on the economy.

Water infrastructure and economic development must be planned together. You cannot have one without the other.

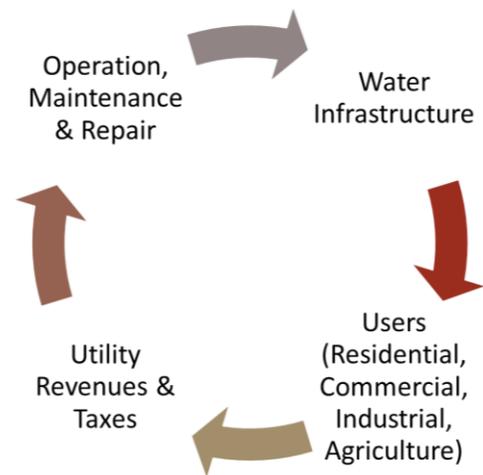
Business development on the Nation is hindered because the water infrastructure is either non-existent or the existing water infrastructure is operating at or near capacity and cannot support growth. Tax dollars and utility revenues generated from a thriving economy are necessary to offset the operation, maintenance and repair (OMR) costs. The tax dollar and utility revenues also provide opportunity to reinvest back into new water infrastructure.

Figure 2 illustrates the dependency of the water infrastructure on the economy. The water infrastructure is needed to serve the various users which comprise of the larger economy (e.g., residential, commercial, industrial, agriculture). The users then pay for water service through utility revenues and privilege taxes. These revenues are then used to offset the OMR costs of operating the water infrastructure and can also be reinvested back into new infrastructure. Currently, the lack of large commercial and industrial users is short-circuiting the cycle.

The lack of businesses, commercial and industrial users on the Nation has put strains on NTUA, the utility provider for the Nation (R. Kontz, NTUA, personal communication, October 7, 2013). NTUA has many miles of pipeline but has few connections per mile. This results in OMR costs for many of the existing water systems exceeding the revenues generated by water users. Thus, NTUA must rely on grants and other types of aid to cover costs (R. Kontz, NTUA, personal communication, October 7, 2013). As most of the users connected to NTUA systems are residential, the burden falls on the residents. In effort to keep rates affordable for a population with below average incomes, NTUA cannot raise utility rates to keep up with increasing OMR costs. It is rare that NTUA has excess dollars to reinvest back into new infrastructure and is often obligated to take over projects in which OMR costs exceed revenues. As the infrastructure ages, OMR costs will continue to increase and the gap between revenues and costs will widen.

The lack of a sustainable economy, lack of jobs and basic services has resulted in population decreases over parts of the Navajo Nation (NDED 2010). Residents are leaving outlying areas and moving to nearby border towns and cities, which have the economic base to support jobs. Between 1980 and 1990 the off-reservation Navajo population in New Mexico, Arizona and Utah grew by 125% whereas the on-reservation Navajo population grew by 22% (NDWR 2011). In addition, vital tax dollars, currency circulation and revenues are leaving the reservation, due to the lack of basic wholesale and retail outlets. Approximately \$0.64 of every dollar earned on the Navajo Nation is spent off the reservation (NDED 2010).

Figure 2. Sustainable Cycle of Water Infrastructure and the Economy



Developing a sustainable economy along with a sustainable water infrastructure is crucial to the Nation's future.

Non-Comprehensive Project Planning

Efforts to improve the water infrastructure coverage on the Nation has been well underway. Current planning efforts and the development of water infrastructure on the Nation is a combined effort of several agencies consisting of Navajo Nation agencies and U.S. government agencies. Navajo Nation agencies include the Navajo Nation Department of Water Resources (NDWR) and NTUA. U.S. government agencies include but are not limited to the Bureau of Reclamation (Reclamation) and the Indian Health Service's Division of Sanitation and Facilities Construction (IHS-SFC). With multiple agencies working on the addressing the needs, there is no comprehensive plan. Each agency operates under its own set of objectives without any leading agency. The lack of a unified vision for infrastructure development is resulting in missed opportunities.

An example of this singular objective planning is the IHS-SFC program which has a specific health improvement objective and funding is limited strictly to residential improvement as defined in Public Law 94-437. In some cases, it may be

difficult to plan and construct IHS distribution systems in conjunction with other water projects that may aim to support commercial growth. Exhaustive efforts are required to overcome these administrative constraints and often results in missed opportunities. The IHS-SFC program is only allowed to design water systems using a water demand of 50 gallons per day per capita (gpcd), which is adequate for in-home usage. But is not enough to support the crucial large commercial and industrial users needed to sustain a vibrant economy. Water demands ranging from 120 to 160 gpcd are needed to support more sustainable economies.

Furthermore, key Navajo agencies need to be more involved in the water infrastructure planning process such as the NDED and the Navajo Housing Authority (NHA). It is critical to know what is being built and where it is being built in order to properly assess, design, construct and operate the water infrastructure.

External Influence from Non-Navajo Agencies

Current water infrastructure planning is strongly influenced by external perspectives rather than from the Nation's own viewpoint. Generally, studies conducted by non-Navajo agencies fail to recognize the unique and underlying challenges facing water infrastructure development on the Nation. Current planning of water infrastructure does not consider a holistic view of issues that plague the Nation. This is an inherent problem as the Nation seeks aid from outside sources and can result in planning and design that is biased toward the agency providing the funding while failing to recognize the Nation's best interests. Economic and engineering factors are not the only concerns that may affect the feasibility or selection of a water infrastructure project. Benefits and costs linked to the culture and way of life may go unrecognized and unaccounted for. In addition, the connectedness of economic needs, environmental considerations, health and social impacts should be considered during project planning.

Project planning from the Nation's perspective would account for costs, benefits and savings that may not normally be considered. The Nation understands the connectedness of these social, environmental and economic systems, so they must take the lead in project planning and selection to ensure that a project will have significant impacts (get the biggest "bang for the buck"). The Nation is best suited to distinguish these differences and modify or adapt project objectives accordingly. Finally, the Nation should be able to discern which projects and objectives are most important to its nationwide needs and livelihood.

Short Term Solutions

Address the Immediate Needs: Food, Water, Supplies and Medical Services

With the influx of resources and capital, the Nation should continue to address the immediate needs such as getting food, water and supplies to residents and ensuring that the healthcare and medical services have the adequate resources needed to fight the COVID-19 pandemic. Bringing food and water to residents or establishing drive through pickup points should reduce travel as residents will not have to risk leaving the Nation to enter border towns.

Establish a Water Delivery Service

With the stay-at-home orders, the Nation is requiring individuals to stay at home to reduce travel and reduce exposure. However, those without running water must still travel in order to get the necessary water supplies for survival.

Depending on the resident, the amount of water they can bring back to the home is limited by their means of transportation and ability to store water at home. Homes that have a cistern or some other means to store more water can go for a longer period without hauling water and may have a lower risk of contracting COVID-19. Homes that do not have any type of storage system cannot go as long and will require more frequent water hauling trips.

According to the World Health Organization (WHO; 2013), a minimum of about 13 gpcd is recommended to take care of drinking, cooking, personal washing, clothes washing and home cleaning needs. This can be used as a minimum targeted supply that the Nation should try to get to its remote residents. However, with the summer heat on the rise coupled with the recommended increased handwashing requirements to combat COVID-19, and livestock uses, the actual need will likely be much higher.

The establishment of a large-scale Nation-wide water delivery service coupled with the installment of cisterns for remote residences is an immediate solution that the Nation can begin to implement with the influx of additional resources. This will reduce the need for residents to travel to obtain water. Initially the water delivery can be provided through an in-kind service that can eventually be turned into a more permanent and sustainable solution that requires a monetary payment. With water haulers currently spending about 70 times the amount for a gallon of water compared to residents connected to water systems, there is opportunity and a capacity to pay.

Fund Current In-Progress Projects

The Nation currently has a multitude of water and wastewater infrastructure projects underway that are under

construction or that are construction-ready. Providing funding to complete projects in-progress that may have funding shortfalls would be a good use of the additional influx of resources. Continuing to fund construction projects will also help provide some of the much-needed jobs for the residents of the Nation.

Long Term Solutions

The influx of outside resources, donations and support has been good for the Nation during this calamitous time, but unfortunately a lot of the aid is only satisfying the immediate needs and is a temporary “band-aid” fix that is not addressing the root of the problem. After the COVID-19 cases reduce and headlines subside, the overall underlying problem still will not have been addressed.

The Nation will be able to put out this fire, but what about a potential second wave of COVID-19? A different pandemic? Drought? Climate Change? Economic Recessions? These potential disruptions will also be exacerbated if things are not fixed. The root of the problem must be addressed, and a significant effort must be spent on long-term solutions. Left un-addressed, the Nation will leave itself vulnerable to the next social disruption. Fixing the underlying issues requires a call to action from the Nation’s leaders and government departments to enact change.

Global Water Master Planning and Project Prioritization

An integrated planning framework for water infrastructure implementation that can balance economic development and health objectives is needed. A Nation-wide global master planned approach driven by a common vision is needed to plan, design and integrate all stakeholders and agencies. The master planning must be led by the Nation and not an outside agency. This integrated planning framework must also involve input from the Navajo Nation Council as to which water infrastructure projects should get funded. With project capital cost needs greatly exceeding available funding, not all projects can be constructed simultaneously. Thus, the Nation’s leaders must decide which projects should be funded first and in a systematic manner, which is not an easy feat.

Decision Support System

In instances where complex decisions with multiple objectives must be made, decision support systems (DSS) have proven to be effective tools. A DSS is a tool (information system) that supports decision-making processes. It is backed by objective data but can be integrated to involve human judgement. Riley Engineering has developed a prototype DSS to guide strategic planning and aid in prioritizing water infrastructure specifically for the Navajo Nation.

The DSS aims to: (1) quantify the range of impacts of a project; (2) guide alternative evaluation; (3) promote interagency coordination; (4) focus resources and planning efforts (e.g. engineering and pooling capital); (5) support final project selection; (6) give tribal leaders the transparency needed to justify their investment decisions; and lastly but most importantly, (7) it will provide a unified vision for the comprehensive planning that is needed to integrate water infrastructure with economic development. The DSS tool can provide the guidance needed to address the root cause of the water infrastructure deficiencies on the Nation. The DSS can help provide the framework for new legislation that will align with the master planned approach. Refer to Chee and Lansley (2017) for detailed information regarding the prototype DSS.

About the Author

Dr. Ronson Chee is practicing Navajo civil engineer who grew up on the Navajo Nation. Dr. Chee is the first Navajo to receive a Ph.D. in Civil Engineering with an emphasis in water distribution systems. Growing up on the Nation he has experienced the water challenges firsthand and has devoted his career to solving the water infrastructure deficiencies on the Navajo Nation. Dr. Chee founded Riley Engineering specifically to address the infrastructure deficiencies on the Nation.



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