

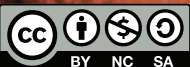
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# *Learning from the Challenges of the Melamchi Water Supply in Kathmandu*

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# Learning from the Challenges of the Melamchi Water Supply in Kathmandu

Ritu Poudyal

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In Maitidevi, Kathmandu, residents rise every day at 3 a.m. to the shrill ring of their alarm clocks. The first order of their day is to rush out of their homes to check for an inflow of water and then turn on their squirrel-cage induction motors to boost the water flow. They need to quickly collect water into water tanks before their neighbors turn on their motors, which would decrease the flow.

Pramila Sharma lives in Maitidevi with her family. Each morning, she routinely rises early, often giving up sleep so that she can store enough water for her family. Occasionally, water flows in as expected at 3 a.m., but for most days of the week, her efforts are in vain.



*Photo by Gaurab Pant*

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Review and comments by experts from the ADB's South Asia Department are appreciated.

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**Nepal has 2.7% of the earth's freshwater, yet the people of Kathmandu, Nepal's most developed region, struggle with scarce water supply.**

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By sacrificing a few hours of sleep, Pramila and her neighbors are able to collect a moderate amount of water. But residents in other parts of the Kathmandu Valley, including those living in Kathmandu, Lalitpur, Kirtipur, Bhaktapur, and Madhyapur Thimi, are not as fortunate—some have had not even a drop of water, while others are able to collect water only once a week. The chronic shortage of water has compelled some people to build underground water extraction and filtration facilities in their houses as safer alternative water sources. But those who cannot afford to build such facilities have to either buy water from private suppliers or walk a long way to fetch water from the public and traditional taps in the valley. Nepal has 2.7% of the earth's freshwater, yet the people of Kathmandu, Nepal's most developed region, struggle with scarce water supply.<sup>1</sup>

Pramila did not have to worry about water when she first moved to Maitidevi about 15 years ago. Through the years, however, the rapid urbanization of the area and the overexploitation of groundwater reserves have increasingly depleted the water resources in the valley. Government efforts to address water scarcity have been minimal, only worsening the situation. For about 10 years, Pramila and the rest of Kathmandu Valley residents have waited for the project to resolve their water problem, only to lose faith as project deadlines were repeatedly extended and project implementation lagged.

## **Background**

Water security is a prerequisite for the development of a nation. A sustainable and safe water source is essential for human well-being, economic development, ecosystem preservation, and the prevention of water-related hazards. However, about half of the world's population now experiences water scarcity for at least 1 month per year, and the number of affected people is expected to increase to about 4.8 billion–5.7 billion by 2050 (Burek et al. 2016). At present, 41% of the world's population lives in river basins that are under water stress. Rapid population growth, climate change, water pollution, overexploitation of water reserves, industrialization, economic development, and mismanagement of water sources have depleted water sources and changed water ecosystems, causing floras and faunas to become extinct sooner.<sup>2</sup>

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**About half of the world's population now experiences water scarcity for at least 1 month per year.**

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<sup>1</sup> International Water Management Institute. Nepal - South Asia - Regions. <http://www.iwmi.cgiar.org/where-we-work/asia/south-asia-region/nepal/> (accessed 6 March 2019).

<sup>2</sup> World Wildlife Fund. Water Scarcity. <https://www.worldwildlife.org/threats/water-scarcity> (accessed 14 November 2018).

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## About 73% of the world's population who now face water scarcity lives in Asia.

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About 73% of the world's population who now face water scarcity lives in Asia. Despite the development initiatives in the region to tackle the water problem, the rate of scarcity is expected to reduce to only 69% by 2050 (Burek et al. 2016). The water security problem is increasing the number of people below the poverty line—when freshwater sources are lacking, people are forced to opt for alternative sources that are likely to be more expensive because of privatization. Furthermore, polluted water resources and inadequate sanitation facilities can lead to the spread of various waterborne diseases and expose marginalized groups of people to health risks.

## *The Water Situation in Nepal*

Nepal has abundant natural water resources. It has about 6,000 rivers that drain into a 191,000-square-kilometer (sq km) area, 74% of which is located within the country. The country's agricultural economy is highly dependent on these water sources for its development. Out of a total water supply of 15 billion cubic meters, industries use 0.3%, domestic use accounts for 3.8%,



Photo by Sonia Awale/The Nepali Times



and agriculture the remaining 95.9% (Aryal and Rajkarnikar 2011). However, water is scarce in many parts of the country because connections from the water sources to those areas are inadequate.

The Government of Nepal has struggled to meet the water demands of its citizens and industries. According to the World Health Organization (WHO)/United Nations Children's Fund (UNICEF) Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (WHO/UNICEF JMP), Nepal met its Millennium Development Goal target in 2015 as 92% of Nepal's citizens had improved access to water (UNICEF and WHO 2015). However, as Kathmandu Valley, the country's most developed and populous region, urbanized rapidly over the years, the water demands of households, businesses, and industries increased, leading to a severe water crisis.

The growing population of the Kathmandu Valley led to the overconsumption of traditional freshwater sources in the region. For this reason, the government took the initiative to provide drinking water by establishing the Pani Goswara water supply system in May 1973 (NWSC 2013). Since then the organization developed and expanded and, in 1990, under the Nepal Water Supply Corporation Act, the responsibility for water supply and management was handed over to the Nepal Water Supply Corporation. In February 2008, the Kathmandu Valley Water Supply Management Board (KVWSMB) granted Kathmandu Upatyaka Khanepani Limited (KUKL) a 30-year license to provide water supply and sanitation services under a public-private partnership agreement (KUKL 2008). However, despite the change in authority, the water shortages persisted.

The people in Kathmandu Valley have also overused groundwater reserves. When groundwater is not allowed to recharge, the rivers flowing through the valley become increasingly polluted and unsafe for daily use.

About 40–50 years ago, water from the Bagmati River and its six major tributaries was clean enough for residents to use directly as their primary source. However, environmental degradation and pollution contaminated the rivers, making the water hazardous for daily use. Meanwhile, most of the communities had access to *dhunge dhara* (stone spouts) or *padhero* (natural spouts) so they did not have to face the water crisis. Over time, however, deforestation continued, pollution worsened, and residents continued drawing groundwater until the traditional water sources dried up. Today, only a few traditional taps still function and not everyone has access to them. Therefore, people have to either sacrifice their time and energy by queueing to fetch water from these taps or purchase water from private sources.

Inadequate access to proper water sources has escalated the incidence of diseases in Nepalese communities (Government of Nepal, Ministry of Urban Development 2014). Nepal's contaminated rivers and rivulets have widened the spread of various waterborne diseases and have become a breeding ground for mosquitoes. Furthermore, the lack of maintenance and continuous checks of traditional communal taps and spouts have caused chemical poisoning.

To provide a sustainable supply of safe water and improve the health and well-being of the community, the Government of Nepal introduced the Melamchi Water Supply Project.



## **Melamchi Water Supply Project**

The Melamchi Water Supply Project (MWSP) is the biggest project undertaken by the Government of Nepal in partnership with the KUKL. The Board of Directors of the Asian Development Bank (ADB) on 21 December 2000 approved the project, which became effective on 28 November 2001 (ADB 2014). The project aimed to connect the water supply from the Melamchi River in the Sindhupalchowk District to 180,000 households in the Kathmandu Valley.

The project is divided into two subprojects.

### **Subproject 1: Melamchi River Water Diversion Subproject**

Subproject 1 of the project would divert 170,000 cubic meters of water per day ( $\text{m}^3/\text{d}$ ) from the Melamchi River to the water treatment plant in Sundarijal, Kathmandu, through a 26.5-kilometer (km) water diversion tunnel. This phase covers all construction activities in the Melamchi area and the building of roads connecting the water source to the treatment plant. From an initial capacity of 170,000  $\text{m}^3/\text{d}$ , the water treatment plant would treat up to 510,000  $\text{m}^3$  of water per day after the completion of two more phases (Joshi 2017). The Melamchi Water Supply Development Board (MWSDB) was given responsibility for the first phase of the project.

### **Subproject 2: Kathmandu Valley Water Supply and Sanitation Subproject**

Subproject 2 focuses on the proper distribution of water and the improvement of the existing water supply systems around the Kathmandu Valley, including the examination of the underground water supply network to minimize water leakages in the future and guarantee water delivery standards.



*Photo by Amish Regmi/Hakahakionline*



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## **The MWSP could be a long-term solution for the chronic water shortage in the valley.**

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In addition to ensuring the connectivity of the water treatment plant to nine service reservoir tanks, this phase also involves the development of a bulk distribution system throughout the area.<sup>3</sup> The Project Implementation Directorate of the KUKL, operating under a 30-year lease and license agreement with the MWSDB, is handling the second phase of the project.

The MWSP could be a long-term solution for the chronic water shortage in the valley as the project aims to deliver safe drinking water according to the WHO's guideline to improve the distribution network and as set out by MWSP Subproject II.<sup>4</sup> The Kathmandu Valley residents have long held high hopes for the project to deliver a sustainable water supply, but 18 years since the project commenced and several project deadlines have passed, with no end in sight.

## **Project Completion Challenges**

Despite the loans and technical support provided by various international agencies, such as ADB, the Japan International Cooperation Agency, the World Bank, and agencies from Norway and Sweden, completion of the MWSP continued to be delayed, owing in part to political upheaval. As reported in the 12 April 2006 Melamchi Water Supply Project news update of the Japan Center for a Sustainable Environment and Society, the massacre of Nepal's royal family in June 2001 destabilized the country's political environment. As the king dissolved the National Assembly in 2005 and the Maoist group rose to power, international financiers pulled out of Nepal on account of human rights concerns. Sweden withdrew its funding from the project in April 2006, and Norway followed in July 2006. Initially, the project budget totaled \$464 million, of which ADB had invested \$120 million, the World Bank invested \$80 million, and the Japanese government invested \$52 million through the Japan Bank for International Cooperation and \$18 million through the Japan International Cooperation Agency. However, the World Bank's dropout resulted in a large financial deficit, and the retraction of Norway and Sweden amounted to an additional deficit of \$50 million.<sup>5</sup>

Despite the delay caused by the dropout of major project financiers, the Government of Nepal, persevering in its commitment, succeeded in convincing ADB to cover the financial deficit and extend the closing date of its loan. Thereafter, in 2007, the stakeholders of the project decided

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<sup>3</sup> Government of Nepal, Melamchi Sub-Project 2. Project Implementation Directorate: KUKL. <http://www.kuklpid.org.np/Home/Introduction> (accessed 18 March 2019).

<sup>4</sup> Government of Nepal, Ministry of Water Supply. Melamchi Water Supply Project. <http://www.mowss.gov.np/content/melamchi-water-supply-project.html> (accessed 14 November 2018).

<sup>5</sup> Japan Center for a Sustainable Environment and Society. Monitoring of Melamchi Water Supply Project 「環境・持続社会」研究センター. <http://jacses.org/en/sdap/melamuchi/index.htm> (accessed 17 March 2019).



to restructure project implementation into two different subprojects to divide the responsibilities and expedite project completion. Furthermore, funds were reallocated among the other project components to reduce the total cost. Having overcome the financial hurdle, the project then faced the greatest challenge: the cancellation of the Melamchi Tunnel contract in September 2012, which handicapped project financing and lengthened project implementation. The Chinese Railway 15 Bureau Group was awarded the project contract in 2009 after the project restructuring, but the unsatisfactory performance of the group led to its contract termination. After additional financing of \$25 million from ADB, the contract was put out for rebid in November 2012. On 21 June 2013, Cooperativa Muratori e Cementisti di Ravenna (CMC) of Italy won the bid for NRs8.7 billion with a completion target of 30 September 2016 (ADB 2014).

Despite the political, management, financial, and environmental hurdles, the project progressed gradually. But then on 25 April 2015, a devastating 7.6-magnitude earthquake struck Nepal with the epicenter in Sindhupalchowk district, the site of the water source and ongoing tunnel excavation. Damaged and impassable roads to the project site delayed the project even further.

By mid-2018, contractors successfully poured concrete on 9.5 km of the tunnel and completed 3,600 meters of tunnel work (Mandal 2018). The project focused on providing better utility to suppliers, increasing the project's supply area, and developing plans to control the wastewater and safeguard water quality.

In the Kathmandu Valley, wastewater comprises about 40% of the 100 million liters of the daily supply. With the MWSP, an additional 170 million liters per day was supposed be available by the end of 2018 for distribution (ADB 2018). But despite the accomplishments and ambitious planning, the project deteriorated.

On 12 April 2018, the project accomplished one of its biggest milestones—completion of the longest tunnel excavation project in Nepal (ADB 2018). At the breakthrough ceremony, the government set a target for testing and completing the tunnel by July 2018 (ADB 2018). At present, less than 5% of the first phase of the project—or only 960 meters of concrete lining in the tunnel—remains to be completed (Mandal 2019). However, CMC's resignation from the project cast the project's future into uncertainty. Given the circumstances, the government could either convince CMC to expedite and complete the project or rebid the contract to another contractor to finish the remaining work.

Facing backlash for continuing project delays, the Government of Nepal is greatly pressured to complete the project. To avoid a new bidding process, which would delay the project for yet another year, the Nepalese government tried negotiating with CMC to return to Nepal and complete the project.

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**It is imperative for the government to conduct careful and comprehensive consultations with project managers and investors before making project-related decisions while expediting project completion.**

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In response, the Rome-based construction company made several demands, such as scheduling a meeting in a different country and asking for additional compensation for lost time, raising doubts as to the company's true intentions (Mandal 2019). According to CMC, the Government of Nepal would have to pay them an additional NRs6.5 billion; and as CMC had filed for bankruptcy in the Italian court, its return to the project would only result in further losses for the project (*The Himalayan Times* 2019). Also, bringing back the company after paying a huge amount would make Nepal look weak in the international market and decrease the prospect of foreign investments for future development projects. It is imperative for the government to conduct careful and comprehensive consultations with project managers and investors before making project-related decisions while expediting project completion.

## **Project Aftermath**

Upon completion of the first phase in 2016, the project incurred a supply deficit of 102 million liters per day (MLD). It is estimated that upon project completion and with the required infrastructure, treatment methods, and distribution capacity, Kathmandu Valley will have no water deficit by 2023–2025 (Udmale et al. 2016). The successful completion of the MWSP would encourage the government to undertake similar complex projects in the future, apply the lessons learned in addressing similar problems when collaborating with international contractors, and, most of all, gain the trust of its citizens, other countries, and foreign investors.

Not only will a sustainable water supply improve the health and well-being of the Nepalese people and make their lives more convenient, it will also make them more efficient as they invest their time in other development work.

## **Conclusion**

The lack of basic infrastructure has constrained development in Nepal, particularly in Kathmandu Valley as it undergoes rapid industrialization and urbanization.

The MWSP has successfully laid water supply pipelines over a distance of around 1,000 km. Through the project, the government has helped address the water needs of the region by connecting 54,571 of the 78,042 consumers to new tap lines (*The Kathmandu Post* 2018). Over the past 2 decades, however, the project's target deadlines have been pushed back time and again,



disheartening people's hopes and causing them and investors to question the government's ability to execute the project.

Many people still wake up early to walk to the traditional taps and fill their water containers. Besides being an inconvenience, the chronic water shortage also affects the people's productivity. Furthermore, the spread of various diseases through the communal water sources poses health risks to residents. As Kathmandu Valley is the central commercial area of Nepal, the government must take measures to expedite the completion of the MWSP.

As a landlocked developing country, Nepal relies highly on the international community for support in implementing various development projects in different sectors. The MWSP is the most ambitious and high-scale project the government has undertaken in partnership with several international organizations and contractors. Its successful and rapid completion will not only satisfy its citizens but also showcase the government's potential so that it can continue receiving financial, advisory, and technical support for development projects in various other sectors.

As the project nears completion, the government should also make plans for the continuous checking of distribution systems, water quality, and infrastructure maintenance. It should also conduct studies on the environmental, social, and economic impacts of the project to determine its overall success. The MWSP and the challenges it has faced will undoubtedly provide valuable insights for Nepal's future development projects. The government and stakeholders should refer to the project and learn from its mistakes and mismanagement so that future projects can be completed within their expected timelines and thereby help uplift the hopes of the Nepalese people.

This case study has been developed solely as a basis for class discussion. It is not intended to serve as a historical record, a source of primary data, or an illustration of effective or ineffective management.

## References

- Aryal, R. S., and G. Rajkarnikar, eds. 2011. Water Resources of Nepal in the Context of Climate Change. Kathmandu: Government of Nepal, Water and Energy Commission Secretariat. <http://www.wecs.gov.np/uploaded/water-recource-climate-change.pdf>.
- Asian Development Bank (ADB). 2014. *Report and Recommendation of the President to the Board of Directors: Proposed Loan for Additional Financing to Nepal for the Melamchi Water Supply Project*. Manila. <https://www.adb.org/sites/default/files/project-document/79831/31624-024-rrp.pdf>.
- . 2018. Nepal's Longest Tunnel Brings Improved Water Supply a Step Closer for Kathmandu Residents. News release. 13 April. <https://www.adb.org/news/features/nepal-s-longest-tunnel-brings-improved-water-supply-step-closer-kathmandu-residents>.
- Burek, P. et al. 2016. Water Futures and Solution. Fast Track Initiative – Final Report. *International Institute for Applied Systems Analysis Working Paper*. WP-16-006. <http://pure.iiasa.ac.at/id/eprint/13008/1/WP-16-006.pdf>.
- Government of Nepal, Ministry of Urban Development. 2014. National Water Supply and Sanitation Sector Policy 2014. Draft. Kathmandu. [https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/eng\\_wss\\_policy\\_2014\\_draft-1.pdf](https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/eng_wss_policy_2014_draft-1.pdf).
- Government of Nepal, Melamchi Water Supply Development Board (MWSDB). <http://www.melamchiwater.gov.np/about-us/melamchi-ws-project/project-financing/>.
- Government of Nepal, Ministry of Water Supply and Sanitation, Nepal Water Supply Corporation. 2013. Statutory History of NWSC. <http://www.nwsc.gov.np/aboutus.php>.
- Joshi, P. 2017. *Network on Water Technology in Asia and Pacific: Melamchi Water Supply Project, Kathmandu, Nepal*. Japan Water Research Center and Asian Institute of Technology. [http://www.jwrc-net.or.jp/aswin/en/newtap/report/NewTap\\_IWP01.pdf](http://www.jwrc-net.or.jp/aswin/en/newtap/report/NewTap_IWP01.pdf).
- Kathmandu Upatyaka Khanepani Limited (KUKL). 2008. *Annual Operating Report 1 Falgun 2064 – 31 Asadh 2065 (2007/2008)*. Kathmandu, Nepal. [http://kathmanduwater.org/wp-content/uploads/2017/03/Annual-Operating-ReportFY64\\_65.pdf](http://kathmanduwater.org/wp-content/uploads/2017/03/Annual-Operating-ReportFY64_65.pdf).
- Mandal, C. K. 2018. Melamchi Water Will Be Delayed. *The Kathmandu Post*. 25 August. <https://kathmandupost.ekantipur.com/printedition/news/2018-08-25/melamchi-water-will-be-delayed.html>
- . 2019. Government Mulls Ending Contract with Melamchi Builder. *The Kathmandu Post*. 19 January. <http://kathmandupost.ekantipur.com/news/2019-01-18/melamchi-water-project-government-mulls-terminating-contract-with-italian-contractor.html>.
- The Himalayan Times*. 2019. ADB Not in Favour of Govt Plan to Rehire CMC. 27 February. <https://thehimalayantimes.com/business/adb-not-in-favour-of-govt-plan-to-rehire-cmc/>.
- The Kathmandu Post*. 2018. Melamchi Water Supply Project Tests Pipelines. 14 July. <http://kathmandupost.ekantipur.com/news/2018-07-14/melamchi-water-supply-project-tests-pipelines.html>.



Udmale, P. et al. 2016. The Status of Domestic Water Demand: Supply Deficit in the Kathmandu Valley, Nepal. *Water*. 8 (5). doi:10.3390/w8050196.

UNICEF and World Health Organization. 2015. *Progress on Sanitation and Drinking Water – 2015 Update and MDG Assessment*. [http://files.unicef.org/publications/files/Progress\\_on\\_Sanitation\\_and\\_Drinking\\_Water\\_2015\\_Update\\_.pdf](http://files.unicef.org/publications/files/Progress_on_Sanitation_and_Drinking_Water_2015_Update_.pdf).

## Study Questions

1. What factors led to the deterioration of traditional water sources in the Kathmandu Valley?
2. Why did Sweden and Norway decide to stop financing the Melamchi Water Supply Project (MWSP)?
3. What major challenges contributed to the almost 20-year delay of the MWSP?
4. Why is the Government of Nepal eager to expedite the completion of the project even if it had to pay a large amount to CMC? Why was the Asian Development Bank not supportive of the idea to rehire CMC?

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