

# Report on the Carania Dams Development 2016-2024: old and new

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## Background:

The Reserva Paisajística Nor-Yauyos Cochazo of the Central Andes is an important water source for Lima and other coastal urban settlements, through the Mala and Cañete rivers, while also feeding into the Mantaro to the east. Locally the water is used for rural agriculture and herding. As such, investment in modern hydraulic infrastructure is increasingly gathering apace, especially given that Lima is expected to face increasing water shortages by 2030 (Stark *et al.* 2012). This makes the Central Andean watersheds a primary target for modern dam construction. Unfortunately, these modern dams are usually built on top of, or alongside, pre-existing Prehispanic dams, usually destroying them. Currently, many of these ancient dams are unregistered in the Ministry of Culture database, the SIGDA (<https://sigda.cultura.gob.pe>), compounding this cultural heritage loss. Moreover, many of these modern dams are themselves defective through a combination of bad planning, bad government and execution.

Here we present the case of the Carania dams (Figure 1) in the Nor-Yauyos region which represent three old dams (Carania 1, 2, 4) and a new dam (Carania 3) which has displaced an older dam now partially submerged by the new basin. These dams are part of the *Cultural Archaeological Landscape of Carania*, which includes the Cuñepampa and Quepala sectors. Nonetheless, the failure of the modern dam of Carania 3 has meant that remedial works on the dam have necessitated the re-use of the older Carania 3 dam to hold back water so that essential repairs on the modern Carania 3 dam can be effected.



Figure 1: Map of Area showing Carania dams 1-4

Carania dams 1 [UTM Coordinates WGS84 401816E, 8637966 S] and 2 [UTM Coordinates 402016 E, 8637698 S] are located on the lower section of the Quepala Ravine, just above where it meets the stream coming down from Cuñepampa to the west. Carania 3 and 4 are in the Cuñepampa side-valley. Carania 3 [UTM Coordinates WGS84 399697 E, 8637430 S], known as Mama Shiña (also as Cuñe Chico), is a modern dam which has been

built just east of the older Prehispanic dam, which is now submerged. To the west is the Carania 4 [UTM Coordinates WGS84 399503E, 8636672N] or Wilka María (also known as Cuñe Grande) a Prehispanic dam.

### Modern Impact:

Carania 1 and 2 have been partially affected by recent earthworks and the construction of a dirt leading to Carania 3, just slightly west end of the dam wall themselves (Figure 2 & 3).

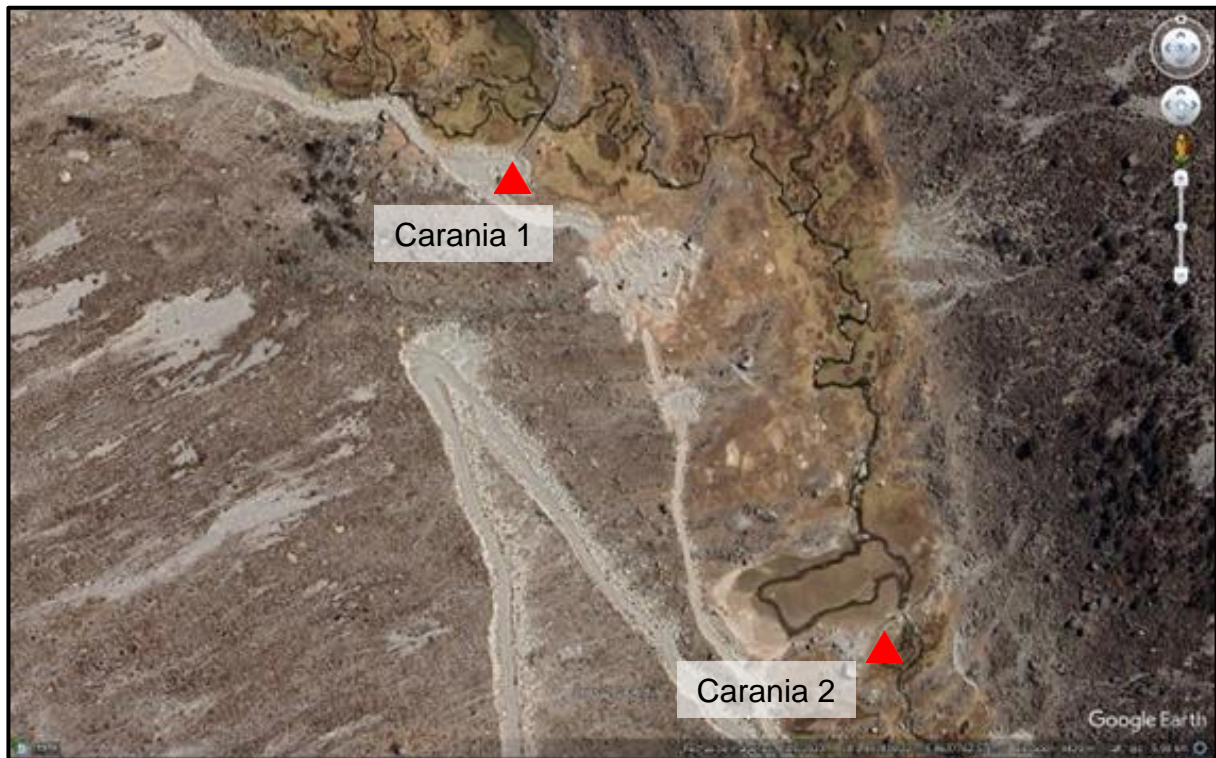


Figure 2: Satellite image showing the location Carania 1 and 2 in the Quepala sector. Note new dirt road and evidence of earthworks related to the Carania 3 concrete dam project



Figure 3: (Left) Carania 1 (lower section of Quepala Creek), earth quarrying can be seen next to the recently opened dirt road. (Right) Detail of earth quarry next to Carania 1

The quarrying and road building is primarily to build access for the Ministry of Agriculture's (MIDAGRI) *Sierra Azul-Punche Peru* project which aims to construct new concrete dams at these four points (Carania 1-4), of these Carania 3 has already been built. Carania 4 (Figure 4) has not yet been impacted but the dirt road has been extended to it and



plans are afoot to build a new concrete dam here too. These construction plans will negatively impact the ancient dams, in most cases leading to their destruction.



Figure 4: Satellite image showing the location and layout of Carania 4, in relation to the Wilka María lake. The image does not yet show the new dirt road that has recently been opened to access the dam and the site where a new concrete dam, similar to the one at Mamá Shiña lagoon, is planned to be built

As mentioned above, Carania 3 (Figure 5) has already been built funded by Gobierno Regional de Lima<sup>1</sup>. Carania 3 is a new concrete dam built c. 90 m east of the old dyke. The rising water of the new dam submerges the old dam, severely affecting its integrity and general state of preservation. Carania 3 is a prime example of what can, and often does, go wrong with modern cement dams.



Figure 5: Satellite image showing the location and layout of Carania 3, in relation to the Mama Shiña lake. Left triangle shows the submerged old dam and the right triangle the new dam built by

<sup>1</sup> <https://ofi5.mef.gob.pe/inviertews/Repseguim/ResumF12B?codigo=2135721/> / <https://www.gob.pe/institucion/regionlima/noticias/520683-gore-lima-avanza-en-la-construccion-de-la-represa-shina-para-afrontar-la-escasez-del-agua-en-yauyos>

MIDAGRI's Sierra Azul Fund.

### Carania 3:

Work on Carania 3 commenced in 2016 and supposedly finished in 2023. Nevertheless, with the onset of the most recent rainy season (November 2023-April 2024) the dam was seen to lose considerable water, negatively impacting on its integrity and long-term potential. The main problems seem to have been that the base wall was too thin and that the prime materials used on the construction were substandard. Therefore, in 2024 the older Prehispanic dam was patched up to hold water back from the new dam so that essential repairs could be undertaken on the new Carania 3 (Figure 6).



Figure 6: Old Carania 3 (left) shored up to hold water while essential repairs are undertaken on the new Carania 3

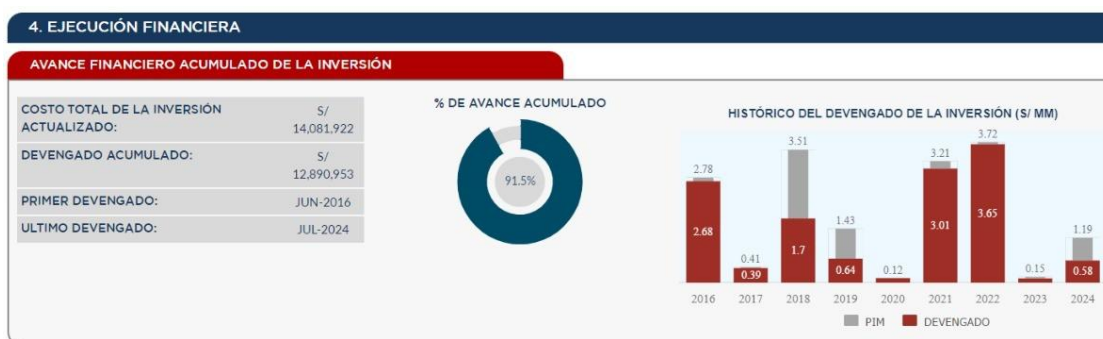


Figure 7: Running costs of the Carania 3 dam (2016-2024)<sup>2</sup>

The initial budget for the construction of Carania 3 was 4,000,000 Soles (c. 1,066,665

<sup>2</sup> <https://ofi5.mef.gob.pe/inviertews/Repseguim/ResumF12B?codigo=2135721>

USD) set in 2016. Since then, costs have spiralled so that by earlier this year the total spend on the dam was 14,000,000 Soles (c. 3,733,330 USD), with an extra 1,100,000 Soles (c. 293,330 USD) earmarked for the repairs of 2024 (Figure 7).

## Final Comments

In end effect, a potential final total spend of more than 15 million Soles (c. 4.026 million USD) has failed to result in a new dam whose waters should have benefitted local rural communities, while replenishing water aquifers for use by urban populations downstream. What is more, the versatility and robustness of the Prehispanic dams is self-evident by the enduring capacity of Carania 4 and especially the fact that a patched-up old Carania 3 is being used while works on the new Carania 3 dam are undertaken.

Our *Past Water Futures* project is dedicated to the rehabilitation and functional use of these ancient dams, what we term *installed capacity*, for the present-day (Landauro 2022; Ardiles Villamonte 2024). This rehabilitation has four main objectives:

1. *Heritage preservation* – these ancient dams are over 500 years old, some of them close to 1,200 years old, many of them in a precarious condition under threat from mining and redevelopment as cement micro-dams. Their preservation is essential for future capacity building through rehabilitation;
2. *Clean water provision* – the rehabilitation of ancient dams in the area boosts water availability for targeted local villages, greatly increasing water security and community resilience against a background of increased climate change and water shortage;
3. *Growing local economies* – Increased water directly impacts economic activity and output. The communities benefitting from these restored dams are in the rural Andean highlands, one of the poorest regions in Peru, more water means more production, especially of cash-products;
4. *Protecting the Environment* – ancient dam rehabilitation does not only restore the dam itself, but it also protects critical high-altitude wetlands which are crucial towards providing apt environments for wildlife and plants.

At a median cost of between 100,000-150,000 USD *per* dam rehabilitation, the total monies spent on the new Carania 3 could have been used to restore between 10-13 old dams for modern communities. While the new Carania 3, if it ever works, would hold more water than the old Carania 3, the restoration of 10-13 Prehispanic dams would retain more water than a single new dam, moreover this water capture could be spread across various watersheds, rather than just the one, potentially benefitting significantly more rural communities, and further downstream, coastal urban settlements. 66 Prehispanic dams have already been identified in the area. *Past Water Futures* is dedicated to making dam rehabilitation a reality across the Peruvian Andes and further afield.

## References:

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