The complex of twelve rock-cut churches in the city of Lalibela, Ethiopia, constitutes one of the world's great architectural ensembles. 1 A lofty, UNESCO-funded, space-frame roof protects some of the churches from the ravages of heat and time. The attention that this site has received in recent decades has intensified scholarly debates about the churches. How were they built? Who designed and directed the operation, and who were the masons? What religious iconography underlies their design? What was their liturgical function? Were they modeled on the Holy Land? Were all twelve built by King Lalibela, who ruled in the early thirteenth century, as tradition claims? 2 While such issues are central to our understanding of the churches, this paper considers a neglected, if no less important, aspect of this religious site: the significance of water. I will argue that the buildings of Lalibela are just as much a hydro-engineering marvel guaranteeing the city's economic existence as they are an attribute of religious symbolism. Lalibela is given little recognition in this regard, even though the most astonishing aspect of the pools associated with the churches is that they are located at the top of a high plateau, one thousand meters above the valley floor.

To get a broader historical picture of Lalibela, one has to start with the demise of the Axumite civilization in the eighth century CE. Axum, in northern Ethiopia, rose to prominence in the fourth century BCE as a metal-producing center and as an important, regional geopolitical power with connections stretching eastward across the Red Sea to Yemen and westward to Nubia. By the fifth century CE, the kingdom began to fade in importance, and the area suffered a period of prolonged decline until the rise of the Zagwe Dynasty in the eleventh century, which had its center in the mountain villages of the Ethiopian Highlands south of Axum. The Zagwe, under the leadership of a priest-king, were Christian; their conversion took place during the Axumite kingdom in the fourth century. Yemrehanna Krestos, who ruled at the end of the twelfth century, was apparently the first Zagwe king to define the parameters of the state, ruling Ethiopia according to the Apostolic Canons. 3 His capital was centered in a now-remote part of the Ethiopian Highlands, some two hundred kilometers south of Axum. Today, all that remains is his palace and a church known by his name, which is still used by the local population and the occasional pilgrim. The buildings are located just inside the mouth of a large, natural cave and have spectacular views eastward into the surrounding valleys. The site was chosen because the cave, despite its elevation of two thousand six hundred meters above sea level, had a remarkable feature within: a natural lake. All that was needed was to reinforce the shore of the lake with foundations to support the church and the palace, and to seal off the space between the buildings with a floor. Access to the water below was provided by a trap door directly in front of the church and still exists today.

The Yemrehanna Krestos church was an important pilgrimage center. Today, one can see the bones of thousands of pilgrims – who, according to legend, came from far-off places – piled up at the back of the cave. However, Yemrehanna's city failed and, apart from the church complex, has long since disappeared. Perhaps there was not enough water for a flourishing city, aside from that one, single source. Or perhaps the farming along the steep hills was insufficient to support the population.

When he inherited the throne, Yemrehanna's younger brother, Lalibela (1181–1221), moved the capital – which was named after him posthumously – somewhat further south to the top of a ridge high above the valley floor. In the design of the city, originally known as Roha, there was not just one church, but at least twelve, all richly endowed and housing a substantial priestly class, who lived off the gifts of food and money from peasants and pilgrims. Even today, Lalibela remains Ethiopia's leading pilgrimage site, welcoming between twenty thousand to fifty thousand believers during important holidays and supporting, at last count, about three thousand twenty-five thousand.
hundred fifty priests and two hundred fifty deacons who are training to be priests, along with hundreds of monks and students.

The churches were built using a relatively unconventional technology: they were carved downwards into the bedrock. This technique dates back at least to 1244 BCE with the building of the Abu Simbel temple by Pharaoh Ramesses II. In the fifth century BCE, the Lycians built hundreds of rock-cut tombs in Anatolia on a similar model, though smaller in scale. The ancient Etruscans of central Italy also left an important legacy of rock-cut architecture – mostly tombs such as those near the city of Tarquinia – as did the Nabataeans in their city of Petra, now in Jordan. The most spectacular examples are to be found in India, where one finds rock-cut sanctuaries dating from the third century BCE to the eleventh century CE.

One key aspect of the Ethiopian churches is that the interiors were carved with just as much detail as the exteriors. The skill needed to accomplish this must be factored into the discussion. Such rock-cut buildings are, for logical reasons, carved from the top down. This also applies to the interior, requiring a great deal of coordination among the masons, who start at the vaults and then work their way downward to the floor, with a complete, ‘reverse’ plan already sketched out in their mind. There are other rock-cut churches further to the south, near the modern city of Addis Ababa, but they all date to roughly the same period – the late twelfth to early thirteenth century.

The question of how the technique of rock-cut architecture came to Ethiopia may never be solved, but its quick arrival and the lack of evidence about interim stages of development strongly indicate that persons skilled in this technique came from elsewhere or were contracted from outside sources. One strong possibility is that the technique came from India, where rock-cut architecture has a history spanning one thousand years. The epitome of Indian rock-cut architecture is at Ellora, where various Buddhist, Hindu, and Jain cave temples and monasteries were built mostly between the fifth and tenth centuries CE; they are complex constructions, not only externally, but with elaborately carved interiors as well, much like at Lalibela. But it is perhaps not just the rock-cutting technique that came from India, but the larger ‘package’ of building and water.

At first glance, the siting of Lalibela on the top of a plateau high above the river might seem odd. But an exposed site by the river would not have been easy to defend, and this reason is often given as an explanation for the choice of the site. There was an additional factor: remarkably, at the very top there was water. Although there are no hydro-geological studies of the site, it is nearly indisputable that the water comes from an artesian pressure system. As is common with artesian systems, the source is miles away – in the Lasta mountain range to the north, which rises to over three thousand meters. With an elevation of about two thousand meters, Lalibela is, in essence, in the foothills of these mountains, the tallest of which is Mount Abuna Joseph. The springs were certainly known by local villagers long before the village was transformed into a capital. But there is a big difference between water leaching out of rocks in a natural process and the water distribution system that was put into place. The design of the water system was accomplished in coordination with the design of the churches. The central theme of the site, in fact, is the ‘River Jordan,’ which is represented by an artificial canyon located between the two clusters of churches and ‘flows’ into a naturally-occurring seam between two hills. A river at the very top of a ridge might seem to be more symbolic than real, but it was real to a great degree and thus also magical. A spring is located at its apex and its water channeled through the site and down along the hillside to the farms.

In making the churches, it is clear that the architects first had to establish the water pressure level as this would mark the depth of the excavation around the church, and thus the scale and proportion of the building. Care had to be taken to find a balance between the depth of the floor of the churches and the height of the water in the wells. If the floor level was too low, it would fill up with water and be unusable. The engineers had to find just the right depth – deep enough so there was room for a church to be carved, but not too deep that access was difficult.

This remarkable aspect of the design process had to be repeated numerous times, since almost all of the principal churches each have a water tank associated with them. In the wet season, the overflow runs through specially constructed channels into the ‘River Jordan.’ In most
of the pools, papyrus grows on the surface. These pools serve a special religious purpose that is still enacted today. During a special ceremony, infertile women are lowered into the pool as a way to restore their fecundity. The papyrus symbolizes rebirth, the birth of Moses, and the Nile River, thus adding to the symbolic charge of the pools. Bete Giyorgis, the famous cross-shaped church, not only has a pool of its own, but also a special corridor oriented eastward, leading to a sacred spring.

Nothing is known for sure about Lalibela’s architect or engineer. But there are some clues. One of the churches is named after a certain Abba Libanos, who must have held considerable stature in the community since this is the only church not dedicated to a saint or biblical figure. Inside the church, one can still see a painting, probably a nineteenth-century copy of a lost original, showing him holding a cane against the top of a mountain. The cane has a cross on top, and, though made of wood, has a metal tip at the end in the shape of a small spade. From the spot where it touches the earth – at the top of a hill – a river springs forth. It is unique among the representations of holy men in Lalibela and is clearly a reference to Moses striking water from the rock.

Who Libanos was is open to conjecture. He could have been a native Ethiopian, and it is most certain that a tradition of water engineering existed, dating back centuries. But how far that tradition had developed is unknown; given the evidence currently available, it was not put to use at Yemrehanna Krestos. Did Libanos travel to other cities to perfect his craft? Did other water specialists come to Lalibela as part of his team? It is possible that Libanos was not Ethiopian, but came from somewhere else as a consultant? One possibility is that Libanos came from India or had trained there.

Indian Hindu architecture is almost always associated with the purifying and symbolic function of the Ganges River. This river is actually recreated at some sites. At Ellora, for example, an artesian well at the top of the hill feeds a now-dry ‘river’ that runs down into the site. But the most dramatic example is found at Mahabalipuram, on India’s eastern coast. Between the seventh and ninth centuries CE, when it was one of India’s leading port cities, a series of rock-cut temples were constructed in and along a nearby plateau. A ‘Ganges River’ runs down the hill from two artesian tanks located at the topmost level of the plateau. One of the tanks is dried up as a consequence of global warming, but the other is still filled with water. The similarities between Mahabalipuram and Lalibela are too close to be ignored. Both sites use an artesian water system to irrigate a symbolic river. Unfortunately, as with modern day Lalibela, there are no studies about the hydro-engineering of Mahabalipuram or, for that matter, Ellora.

What I have been trying to argue is that the carving of the churches and the aqua-engineering were not separate realities, but bound up with each other. Furthermore, in studying such interrelated systems, it is also clear that India is the place where a balance between architecture and water has been achieved at numerous sites. Thus it is easy to imagine that there was a knowledge transfer between Ethiopia and India. Ethiopia was not a land-locked kingdom, but connected to the world through its ports along the Red Sea. What is certain is that Lalibela’s water system served two economies. On the one hand, it was central to the agriculture and economy of the region; on the other, it was part of a brilliantly designed, politico-religious economy that was evidence of divine sanction, and, as such, was ‘proof’ of Libanos’s chosen status.