



A Hidden Water-Harvesting System: The Sassi di Matera

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The water-harvesting system of the ancient Sassi di Matera, in the Basilicata region of southern Italy, represents a clever way of living with water in an arid climate. The terrain, with its soft rocks (Calcarenite di Gravina), provided the foundation for the water-harvesting system that shaped the cave dwellings of Sassi physically, socially and culturally. People caught, guided and stored water in private and public spaces, mostly underground, ensuring its availability for all. In 1993 UNESCO declared the cave village a World Heritage Site. Unfortunately, the water-harvesting system of Sassi di Matera is no longer functioning. Its historic ingenuity is not as visible as the system deserves and its cultural and social values are almost forgotten. Using layered visual analysis – the illustrative method – knowledge can be collected and communicated in drawings to get insight regarding more resilient, circular, and people-related approaches (Bobbink, Chourairi and Di Nicola 2022). This article and the included drawings focus on the water system’s value, from which we can learn today.



KEY THEMES



CLIMATE



Bsk
Dry Semi-Arid (Cold)



< Fig. 1 View of the Sassi di Matera from Belvedere Murgia Timone; in the foreground is the canyon of the stream Torrente Gravina (Source: Isabella Banfi, 2022).

A Smart Urban Water System

Due to low precipitation throughout the year, water is scarce in the Basilicata region, once known as Lucania. Since the Bronze Age, people have used soft rocks (*Calcarenite di Gravina*) to create cave dwellings and cisterns to store rainwater for domestic use and irrigation. The water-harvesting system includes wells, catchment basins, ponds, cisterns, condensers, fountains and *neviere* – large spaces carved in the rocks where snow is stored to cool food in summer – all horizontally and vertically connected by channels. About 2,210 cisterns were identified using a statistical approach, including 2,039 small bell-shaped cisterns, 170 neighborhood cisterns and two large cisterns of 1,300 and 5,000 m³ each (Manfreda 2016). The water harvesting in the Sassi demarcated private and public spaces. Private cisterns could store 10 m³ and consisted of basins and water channels on different levels, helping water to flow smoothly and become progressively cleaner. The *vicinato* – a shared courtyard where children played, and people met – was always accompanied by a cistern serving four – six families. Over the centuries, water shaped the town's physical state and influenced how people lived and worked. The system provided water for the development of an agropastoral society in which most people were engaged in agriculture and animal husbandry.

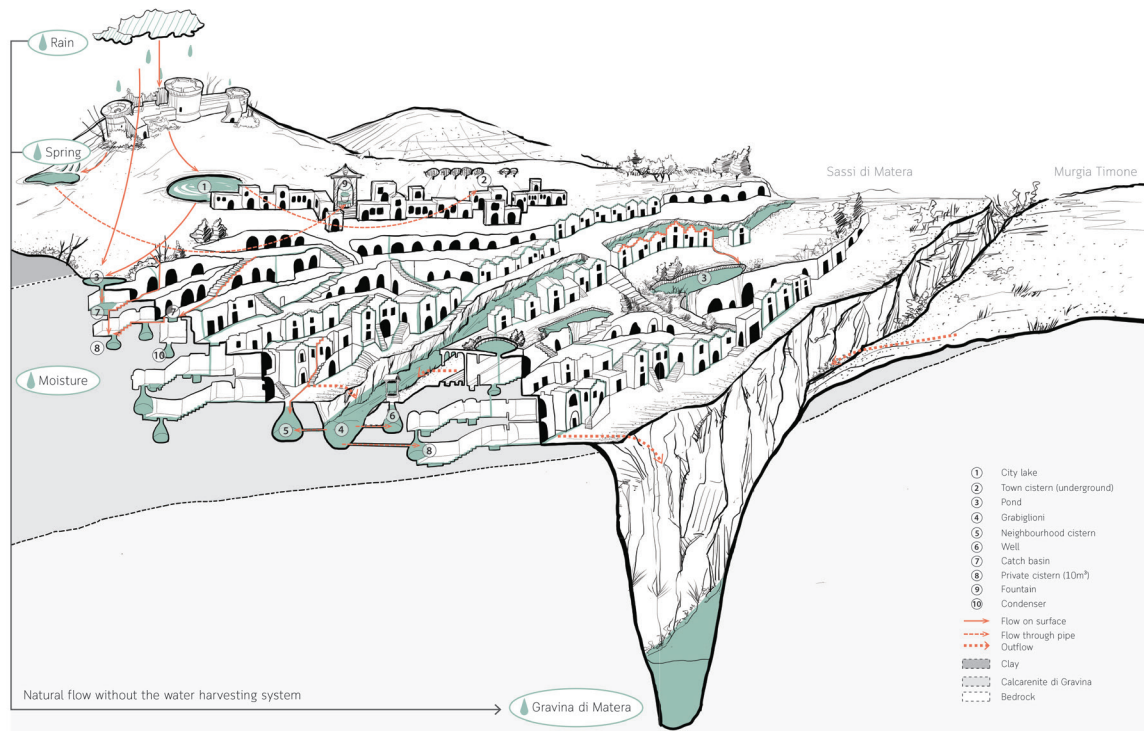
In 1920 the Sele Aqueduct began to deliver water through pipes to the houses, which resulted in neglect of the historic water-harvesting system. The *grabiglioni* (drainage canals) were covered in 1936 and turned into streets. In 1952 52 per cent of the inhabitants were still peasants (Pontrandolfi 2018). At that time, due to the increasing population, cisterns were transformed into living spaces. In 1952 when the town was labeled a “national shame” because of its poor

living conditions, which included sanitation problems, crowding and a lack of electricity, the government evicted people from their homes. Between then and 1960, about 15,000 inhabitants left the ancient center of the community and moved to newly built houses uphill. As a result, the cave city became a ghost town.

In 1993 Matera became a UNESCO World Heritage Site because of its unique combination of site-contextual living and water-harvesting system. Funds were then raised to bring people back to the city. Today, the city's recovery is a success, with more than 700,000 visitors annually. The caves have been transformed into hotels, restaurants, lovely courtyards and alleys. Yet, reactivating the water system for use was deemed unfeasible due to modern demands regarding water quality, hygiene and quantity. Luckily, even though the water-harvesting system is no longer used, most of its elements are still in place.

Current Challenges to Preserving and Managing Matera's Water Heritage

Locals who own hotels and restaurants and those who have taken on other commercial initiatives are pursuing possibilities of preserving elements of the traditional water system so that, even without the water, the importance of the system is recognized as a part of the town's story. Antonella Passione, a member of La Scalotta – a cultural association committed since 1959 to the conservation and enhancement of the historical, artistic and environmental heritage of Matera and the Lucanian territory – renovated a series of *hypogea* spaces, a subterranean part of an ancient building, with three levels and seven cisterns. She converted the space into a restaurant, La Lopa, while maintaining its original shape, materials and appearance and



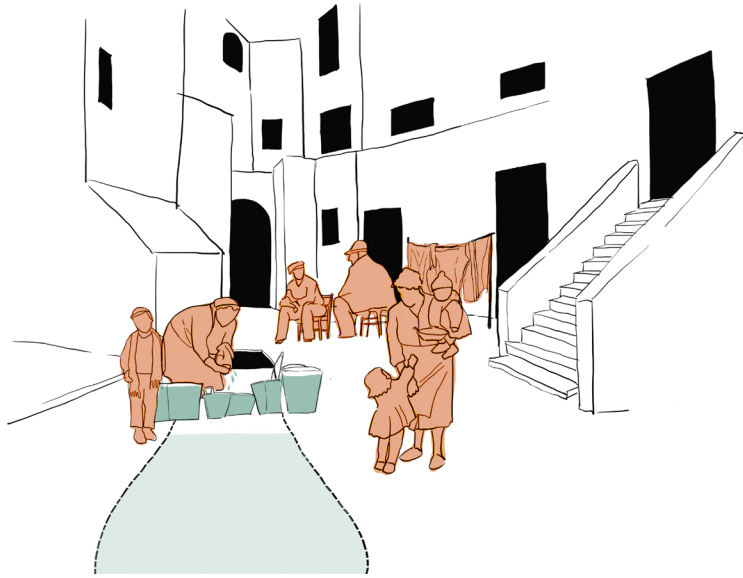
^ Fig. 2 Sectional perspective of the water-harvesting system of the Sassi di Matera depicting the circularity of the system and its sustainability (Source: Wenting Gao, 2022, based on literature review).

without altering the original waterproof layer. La Lopa is an example of preservation through transformation by focusing on the cultural and social values of heritage. Its name originates from the tool, a type of bucket, used to retrieve water from a well. Passione shows her guests the prints of these buckets, which are still visible on the wall. At the lowest level in the cellar, at a depth of 18 meters, she hosts cultural activities, displays films of the old Matera and explains to visitors the traditional water system. For Passione, retelling the stories is a way to remember the times in which, in Matera, resources like water were shared and re-used.

Art also offers ways of restoring appreciation for the traditional water system. Fernando Ponte, the director of Hotel Corte San Pietro, included eight cisterns in his hotel. When Matera was abandoned, the cisterns became garbage

containers. When Ponte arrived, he cleaned them and tried to restore their original function to catch rainwater. However, less frequent and abundant rains made this idea unrealistic. Instead, he participates in the Matera Alberga, Arte Accogliente, a public art project integrating site-specific installations in six Sassi hotels. The art on display makes the visitors more aware of the water system and aims to demonstrate a new reality – a Matera that is welcoming, convivial and participatory. Inside one of the tanks, the artist Alfredo Pirri developed IDRA, an art piece that links the external open space with the interior of the restored cisterns in the courtyard of the hotel. In this way, visitors can still see the underground structures and the water-harvesting system, which was made of tuff, water and tradition.

Another attempt to display the water system



^ Fig. 3 Sassi di Matera: water-centered public life (Source: Wenting Gao, 2022, based on a literature review).

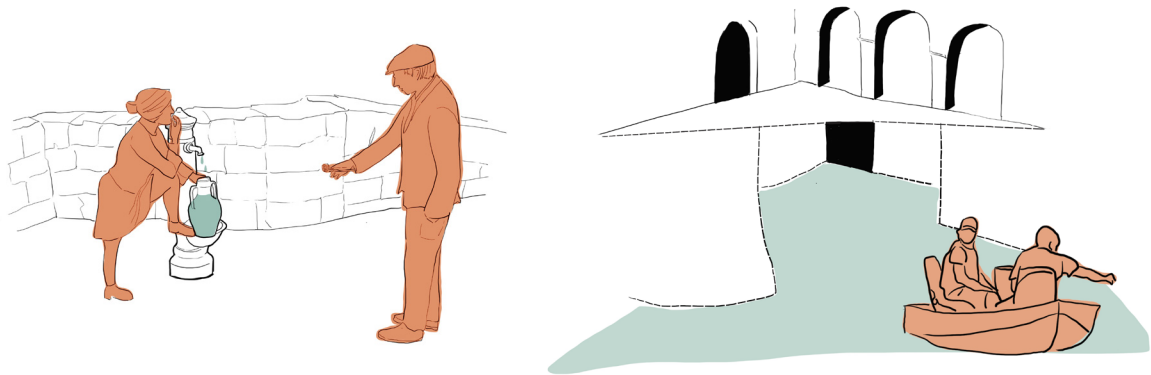
is the recovery of *cisterna del comune in trasano-conca d'aglio*. This project, initiated by Murgia Materana Park Authority and designed by the architect Vincenzo Stella, has revived an old state-owned cistern built at the end of 1700, when people drew water from it for their herds and flocks. Today, the water reserve is used for firefighting to protect the peculiar wood formations in the park (SassiLive 2021).

With the success of Matera, more and more investors are buying properties in Sassi for commercial activities. There are examples of cisterns that have been completely transformed, converted into “fancy” places with concrete floors and stone walls. Residents have been pushed out of the old town. If private stakeholders alter the spaces inside the caves, soon the underground system, and with it, the elements of the water system, will disappear. In this way, tourism contributes to the loss of heritage. Therefore, the value and development of Sassi di Matera as world heritage will largely depend on including the fascinating story of its

water-harvesting system. That story is not only about a practical system, but about cultural and social values.

Lessons Learned

Due to Sassi's unique location and scale, tourism has generated new income for the region. This has not brought back the original function of the site. Instead, when night falls, the town lights up like a giant Nativity scene – an exhibition during the Christmas season of objects representing the birth of Jesus, who lived at a time when people lived in cave houses – a tourist-like image. But from the point of view of a landscape architect, there is so much more to discover and value in the Sassi. The town is an excellent example of how humans could live in harmony with nature by living in caves with fresh water running through them, using the local stone to live in and build with, and producing food by irrigation. Traditionally, people interacted with water daily, understanding its value



^ Fig. 4 Left: Sassi di Matera: public fountain and local rocks (Calcarenite di Gravina). Right: Illustration of the largest town cistern, Palombaro lungo, showing the size of the cistern and the plaza above. (Source: Wenting Gao, 2022, based on a literature review).

because of the effort they made to harvest it. Moreover, the water in public spaces encouraged people to gather. This way of living had a low environmental footprint due to its circular water system.

Today, environmental change makes rainfall unpredictable in Matera. There are periods of severe drought. Floods are also a problem, like in 2019, when rainfall flowing down from the hill-top brought mud and debris, posing a new risk to the cultural heritage. By opening the *Grabigli-
oni*, the drainage canals that channeled both rainwater and wastewater, this disaster might have been prevented. Using the illustrative method, several values can be defined related to the Sustainable Development Goals (SDGs) defined by the UN.

SDG 6

Ensure availability and sustainable management of water and sanitation for all."

The close relationship between the settlement and its water harvesting is almost invisible. The water was hidden and treasured in the

stone city as a resource accessible to all. The complex system not only ensured the sustainable management of water, but also helped to achieve equality in water usage. The spaces once used for water are today transformed into fancy rooms for tourism. Therefore, the outer form and internal mechanics of the Sassi di Matera should be valued equally.

SDG 8

Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all.

Rainwater, spring water, moisture and ice were used sustainably for production, domestic use and drinking purposes. There was also a sustainable use of the building materials (local rocks) because houses built into the caves, and cisterns were made from the same rocks.

SDG 12

Ensure sustainable consumption and production patterns.

The water-harvesting system in the caves de-

depends on the local material, Calcarenite di Gravina. Although most are no longer used, the cisterns are part of the tangible cultural heritage. Restoring the public features of the system by opening the streets, like the *Grabiglioni*, to prevent floods and installing more public fountains using local materials could enhance a sustainable future bound to water, local rocks and people.

SDG 15

Protect, restore and promote sustainable use of terrestrial ecosystems.

The Sassi di Matera demonstrates how a human-made water system can be fully integrated into the living (building) and agricultural landscape. A water design on a regional scale could make not only the old town but the whole city and the region more connected and resilient.

What's missing in the Sassi di Matera is a broader strategy to make the water-harvesting system part of what is valued as heritage. With today's climate crises and the increasing regional droughts, the system can be an inspiration for addressing today's challenges. The recovery of the Cisterna del Comune is a good start. Moreover, water is part of a system that needs to be addressed through scales, from the source until it flows back into the river. The Sassi di Matera and its surrounding area have lost their sustainable knowledge of water harvesting and depend on water supply from afar. With water supplies under such pressure today, we need to learn from the past, especially since harvesting water also contributes to social interaction and helps raise awareness about the value of water.

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