

# WATER HERITAGE

## Global recognition bestowed on South African irrigation infrastructure

*Petro Kotzé reports on South Africa's first World Heritage Irrigation Structures award given to the Douglas Weir.*



Lari van Vuuren

*The Douglas Weir, as it looks today.*

Heritage is not for the sake of heritage, wrote Prof Ragab Ragab. "It has important sustainability lessons for our future survival." President of the International Commission on Irrigation and Drainage (ICID), Ragab commented on the value of the World Heritage Irrigation Structures (WHIS) Awards, established in 2012 as part of a programme that documents historical structures worldwide that have contributed to the evolution of irrigation and drainage in agriculture through history.

This past September, WHIS recognition was given to a South African structure, namely the Douglas Weir, situated on the Vaal River. Prof Sylvester Mpandeli, Chair of the South African National Committee on Irrigation and Drainage (SANCID), ICID Vice-President and WRC Senior Manager, received the award on behalf of South Africa. Mpandeli led the submission of the South African nomination. South Africa now becomes part

of an exclusive club of only three African countries (the other two being Egypt and Morocco) who have had their heritage irrigation structures recognised by ICID. Japan and China are the countries with the most awarded heritage irrigation structures.

ICID is a leading scientific, technical, and professional not-for-profit international organisation working in the field of irrigation, drainage, and flood management to the promote and achieve sustainable agriculture water management. Country membership is spread over 110 countries, covering over 95% of the irrigated area of the world.

Describing himself as a 'hardcore' scientist, Mpandeli says he became fascinated with the rich history of South Africa's water and irrigation infrastructure once he started learning more about it. One reason for this fascination is the drive for transdisciplinary



*One of the canals fed by the Douglas Weir.*

research, which includes socioeconomics, history and culture, over and above biophysical aspects in research. Another, he adds, is the need to understand where we come from and how we came to where we are now. The journey, he adds, has presented him with a unique opportunity to learn.

### **Heritage from a water perspective**

The main objectives of recognition as a WHIS are to understand the evolution of irrigation in civilisations across the world, to gather knowledge about the unique features that have sustained the project for such a long period, to learn the philosophy and wisdom on sustainable irrigation from these structures; and to protect and preserve them.

To be considered for recognition as WHIS, structures or facilities must adhere to a list of criteria. First, they must be older than 100 years. Dams (mainly for irrigation purposes), water storage structures such as tanks for irrigation, barrages, and other water diversion structures, canal systems, old waterwheels, old shadouf (hand operated devices for lifting water), agriculture drainage structures, and sites functionally related to present or past agricultural water management activity are considered.

The structures must represent a milestone or turning point in the development of irrigated agriculture and bear exceptional testimony to the development of agriculture and increase in food production along with the improvement of the economic condition of farmers. The structure must have been considered ahead of its time in terms of project formulation, engineering design, construction techniques, system dimensions, quantum

of water diverted, and size of the command.

The structures must have made an outstanding contribution to enhancing food production, livelihood opportunities, rural prosperity, and poverty alleviation in a region. They must be considered innovative at their time. They must also have contributed to the evolution of efficient and contemporary engineering theories and practices and set an example of attention to environmental aspects in its design and construction.

Lastly, the structure must have been an example of engineering marvel or excellence at the time of its construction and unique in some positive and constructive way. Last, the structure must bear the stamp of a cultural tradition or a civilisation of the past.

From the start of the awards in 2012 until 2023, the WHIS register has grown to include 159 structures from 18 countries. They include China's Chongyi Shangbao Terraces, which, according to the Classic of Mountains and Seas and other historical documents, dates to the pre-Qin period before 221 BC.

Another example is the Qazvin Qanat FazlAli Khan, an ancient Iranian irrigation structure called Qanat, which is still in use today and drives groundwater to the surface using gravitational force. The Persian qanat has a unique niche in the country's cultural, social, economic, political, and physical landscapes.

The list also includes Egypt's Aswan Dam, built across the Nile in 1898 (and completed in 1902). Described as an excellent piece

of engineering work that showcases durability, resilience, high-end engineering skills, and strategic planning, it transformed Egypt's place in history to the extent that it has been described as surpassing the Great Pyramid in service. The country's second entry is the Delta Barrage, constructed from 1833 to 1861 to improve irrigation and navigation downstream along the main Rosetta and Damietta Nile branches. It realised the development of the valuable cotton crop in the vast tracts of the Nile Delta.

The Khettaras in Morocco are also recognised. The Khettaras is a sort of water mine, an underground gallery that intercepts the water of a water table located upstream of the area to be irrigated. It ensured a limited but continued water supply to inhabitants without risking drying up the water table and limiting evaporation to a minimum. In the process, it eliminated the exhausting tasks of water supply chores.

It was these last three awarded structures that made Mpandeli sit up and take notice. While South African irrigation structures are not quite as ancient as those of Egypt, they certainly speak of the country's rich engineering ingenuity, and he was adamant that South Africa also make the list. "Bagging an award would demonstrate South Africa's diverse and rich irrigation infrastructure history," he notes. The Douglas Weir proved to be a winner.

#### **The history and significance of the Douglas Weir**

The Douglas Weir is the country's oldest and the first ever built over the Vaal. At the time of its construction it was considered to be at the forefront of water development in the country and serves as an excellent example of how erstwhile farmers started altering South Africa's water courses to overcome the volatility of the country's natural watercourses.

The purpose of the weir was to provide water to irrigate agricultural lots at the lower end of Douglas, but the farmers needed the weir to help solve water quality and shortage problems. The weir was first constructed in 1890. Shortly after completion, the weir was damaged and, in February 1894, completely washed away by floods. A new site was selected, and work on a masonry weir started again in August 1894. It is located on the south (left) bank of the Vaal River just above its junction with the Orange River.

Except for floods, the weir construction was also affected by drought and budget constraints, Mpandeli says, but the farmers persevered, and construction was finally completed in 1896 (the weir was raised in 1977).

The original Douglas Weir was a diversion scheme comprising a masonry wall some 399 m in length, with a maximum height 3.6 m in thickness built on a solid rock foundation. The weir connected to farms Atherton on the north bank and St Clair on the south bank about eight km above the town of Douglas. Water is transferred via the 24-km, concrete-lined Douglas Canal, which runs alongside the left bank of the Vaal. In 1977, the original weir was replaced with a concrete weir of saw-tooth design with two steel gates on the right flank.

The weir is located in the Lower Vaal Water Management Area and forms part of the Orange–Vaal Transfer Scheme (also known as the Orange–Douglas Government Water Scheme). Owned

by the Department of Water and Sanitation it is central to the Orange–Vaal water user association. The scheme is still in active use today and supplies an area of 8 113 ha of irrigation. Several farming activities occur around the Douglas Weir, including livestock farming and crop production.

Like the rest of the structures honoured, the Douglas Weir has withstood the tests of time and still demonstrates important lessons for water security, food security, and sustainable agricultural water management.

The Douglas Weir was constructed with the exclusive purpose to kickstart irrigation activities in the area so that the agricultural community could produce good quality products over generations. Its original creators wanted to use the weir to create employment opportunities, relieve poverty and stimulate the local economy, notes Mpandeli. "They had a long-term vision and they did not give up until they realised the dream."

Heritage, Ragab said, can also be seen as an intangible force that guides us in future. Mpandeli agrees. He already has a long list of heritage irrigation structures to submit to ICID over the next few years for consideration for inclusion on the official WHIS list. The selection is rich, he says, and it indicates what has been achieved in the country regardless of South Africa's complex and difficult history. "Our heritage can show coming generations that anything is possible and that we can achieve coming goals, together," he concludes.

At the time of writing, the WRC, together with partners, the Department of Agriculture Land Reform and Rural Development (DALRRD), the Department of Water and Sanitation, and the Agriculture Research Council (ARC), were finalising plans to hand over the Douglas Weir WHIS award to the Orange–Vaal WUA.

Prof Sylvester Mpandeli expressed his thanks to the team who aided in the preparation and submission of the Douglas Weir application to ICID, especially colleagues Gerhard Backeberg, Palo Kgasago and Michael van der Laan.



*WRC Senior Research Manager, Prof Sylvester Mpandeli, receiving the award from ICID.*