



EXPERIENCE THE LESOTHO HIGHLANDS WATER PROJECT



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Here in Lesotho, you can experience the
LESOTHO HIGHLANDS WATER PROJECT
*- the most outstanding engineering achievement
of the century!*

WHAT IS THE LHWP?

With its origins going as far back as the early 1930s, the Lesotho Highlands Water Project was conceptualized as one of the many schemes that would be implemented to ensure water security for Gauteng, the industrial heart-land of South Africa, to meet its domestic and industrial needs.

In contrast to the then Orange Vaal Transfer Scheme which would be implemented in Aliwal North, where water would be pumped from Aliwal North to Gauteng, the Lesotho Highlands Water Project proved to be a better option because while the OVTS would only be implemented once off, the Lesotho Highlands Water Project could be implemented in phases to cope with the dynamics of population growth. Apart from that, because of the height in metres above sea-level, water from the highlands of Lesotho would simply descend all the way to Gauteng thereby reducing pumping costs.

The LHWP was implemented following the signing of the Treaty between the Kingdom of Lesotho and the Republic of South Africa on the 24th October 1986. Planned as a four -phased Project, Phase I has been completed, which entailed the construction of the Katse, Mohale and 'Muela Dams and their interconnecting tunnels.

Phase I further comprises the construction of the Matsoku Weir and diversion tunnel as well as the 'Muela Hydropower Station. Following the signing of the Phase II agreement on 11 August 2011, the Lesotho Highlands Development Authority is gearing towards the implementation of Phase II of the Project.

THE TREATY

In order to regulate how the Project would be implemented and how the two countries would benefit mutually from the implementation of the Project, the Treaty was put in place explaining the purpose of the Project and other related issues. The mandate was therefore set out as follows:

- To transfer high quality water to South Africa
- To generate hydropower for Lesotho
- To carry out ancillary developments in the two countries, namely, the provision of potable water and water for irrigation purposes, fisheries and the promotion of tourism

The Treaty also contains some directives on cost allocation to determine which country pays for the water transfer and which of them pays for the electricity component

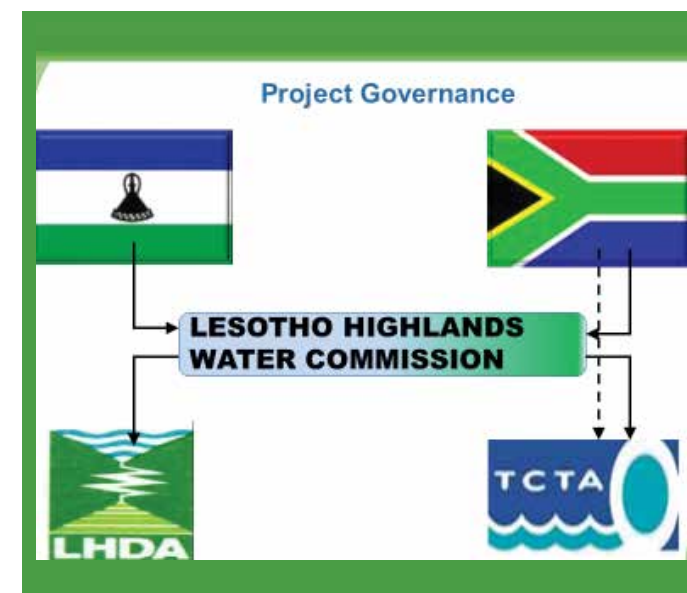
PROJECT GOVERNANCE

Implementation, operation and maintenance of those parts of the Project situated in the Kingdom of Lesotho rests with the Lesotho Highlands Development Authority (LHDA), which reports to a Board that is appointed by the bi-national Lesotho Highlands Water Commission (LHWC). Initially a body comprising 3 members each from South Africa and Lesotho.

The LHWC is responsible and accountable for the successful implementation of all aspects of the LHWP, initially known as the Joint Permanent Technical Commission (JPTC), it transformed into the LHWC as a result of the June 1999 signing of Protocol VI that realigned the respective roles of the Commission, TCTA and the LHDA.

The South African Project authority, TCTA, completed its implementation responsibility and is currently responsible to the LHWC only for the operations and maintenance of the Delivery Tunnel North, Ash River Outfall and appurtenances.

On all other matters, TCTA reports to a Board appointed by the Minister of Water. TCTA is also responsible for the liability management of the LHWP (excluding the hydropower component) on behalf of the Government of South Africa.



FACTS ABOUT THE PROJECT

PHASE 1A AND 1B

KATSE DAM

- 185m high double curvature concrete arch dam
- 1 950 million m³ storage capacity
- 38,5km² surface area
- Completed in May 1997

INTAKE TOWER

- 98m high, standing 77m deep in the water
- 16km upstream Katse Dam wall
- 88m³/sec intake capacity

TRANSFER TUNNEL

- 45km long concrete-lined tunnel
- 4,35m internal diameter

MOHALE DAM

- 145m – highest concrete – faced rockfill dam in Africa
- 947 million m³ storage capacity

MOHALE TUNNEL

- 32km pre-cast segment-lined tunnel
- Links Mohale Dam to Katse Dam
- Allows flow from either direction

MUELA DAM

- 55m high double curvature concrete arch
- 6 million m³ capacity
- Intake delivery tunnel

MUELA HYDROPOWER STATION

- Three 24MW turbines
- Longest headrace in the world

MATSOKU WEIR

- 13m high weir
- 2m³ per second yield

MATSOKU TUNNEL

- 6km tunnel joining the weir to Katse Dam

DELIVER TUNNEL SOUTH

- 15km long
- Contains flow-measuring devices

DELIVERY TUNNEL NORTH

- 22km long
- Lined with pre-cast concrete segments

ASH RIVER OUTFALL

- Concrete outlet structure to channel and dissipate water energy
- Completed – water delivery started in January 1998
- Hydropower delivery – January 1999

PHASE II

POLIHALI DAM

- 163,5m high concrete-faced rockfill dam
- 2,3 million m³ total storage

POLIHALI TO KATSE TRANSFER TUNNEL

- 38km long





Katse Dam is situated in one of the most scenic regions of the Maluti Mountains of Lesotho. Outdoor activities and adventure await the intrepid traveler. Basotho tribesman adorned with traditional Lesotho blankets, riding traditional ponies are a welcoming sight for guests. Katse Dam is situated at 2 000m above sea level. It is described as “a striking piece of modern engineering.”

The Dam is one of less than 30 double curvature concrete arch dams in the world; one of the world’s ten largest concrete arch dams in terms of its volume (1950 million m³); and the highest dam in Africa. As the main storage reservoir of the entire Project, Katse is connected to other augmenting structures such as; the Mohale Dam (connected by a 32km long tunnel) and the Matsoku Weir (connected by a 5.7 km long tunnel). Upon completion the Polihali Dam will be connected to Katse Dam by a 38.5km long tunnel. Katse Dam is best-known in Southern Africa and has received many accolades for its engineering and construction excellence.

The Katse reservoir is currently home to two (2) aquaculture projects; the Sanlei Trout Farm and the Katse Fish Farm. The clean and cold highlands waters are favourable for trout farming, and both projects have proved to be highly beneficial to the alleviation of poverty through job creation, and skills transfer to locals in the Katse and Lejone areas.

KATSE INTAKE TOWER

The Katse Intake Tower is situated in the Katse reservoir, 19km upstream of the Dam. The reservoir depth at the intake is 77 metres. To permit the selection of water at the optimum quality, four draw-off levels are provided, each with four inlets. The total capacity of the intake tower is 88m³ per second of water, through any four intake gates at a given draw-off level. The height of the tower from the foundation level to the top is 98.6 metres. The tower base is 5 metres thick with a diameter of 40 metres.

The Katse Intake Tower is the entry point of the water that is transferred from Lesotho to South Africa. The water begins its

82 km journey from Lesotho to South Africa from this structure.

WHAT TO DO AT KATSE DAM

Katse offers facilities such as a visitors’ centre where tourists can book infotainment tours of the dam wall. Katse Lodge offers fully serviced rooms as well as self-catering accommodation. Explore valleys, mountains and gorges while taking in the breath taking view over the Katse Dam. Guests can venture outdoors to enjoy one of the many leisure activities or relax in this warm and inviting lodge setting, complete with comfortable accommodation and hearty meals.

The Katse Dam offers something for every visitor - from admiring this piece of engineering excellence to 4x4 routes, mountain biking, horse/pony trails around the dam and fishing for Trout or Yellow Fish in the dam. The Makhangoa fly-fishing eco-tourism project is the first of its kind in Lesotho. Situated upstream Katse Dam, in the in-streams of the Bokong River, the Camp is managed and run by Tourette Fishing and the Makhangoa



Tourism Council.

The aim of the partnership is to provide sustainable and beneficial tourism to the area, while conserving the natural resources which attract anglers and ecotourists to the beautiful Bokong valley.



THE TRANSFER TUNNEL

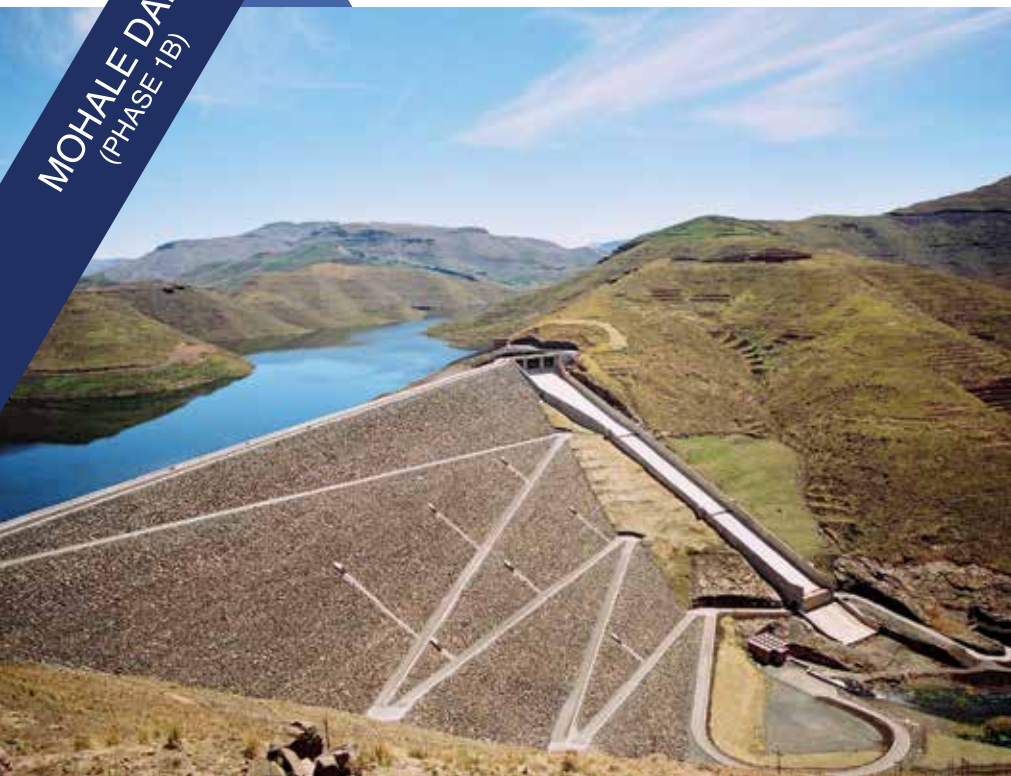
The 45 km long Transfer Tunnel links the Katse reservoir with the Hydropower Station at 'Muela in Butha-Buthe.

KATSE BOTANICAL GARDEN

Several ongoing social and environmental programmes ensue from the Lesotho Highlands Water Project. The Katse Botanical Garden covers 17 hectare and contains a rich diversity of birds, medicinal, ornamental, as well as utility plants. The garden was initially used to house plants that were rescued from the Katse and Mohale Dam Basins. Other plants, collected from various areas in Lesotho, have also been replanted in the garden for conservation purposes.



MOHALE DAM (PHASE 1B)



MOHALE TUNNEL OUTLET

29° 19' 14.4" S 28° 24' 49.5" E

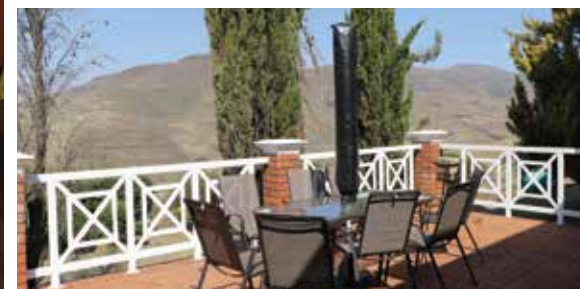
The 32km long tunnel of 4.25m diameter generally allows flow in the direction of Katse Dam. On occasion water flows in the opposite direction to maintain the hydrostatic balance of each reservoir optimising their combined storage capacity.

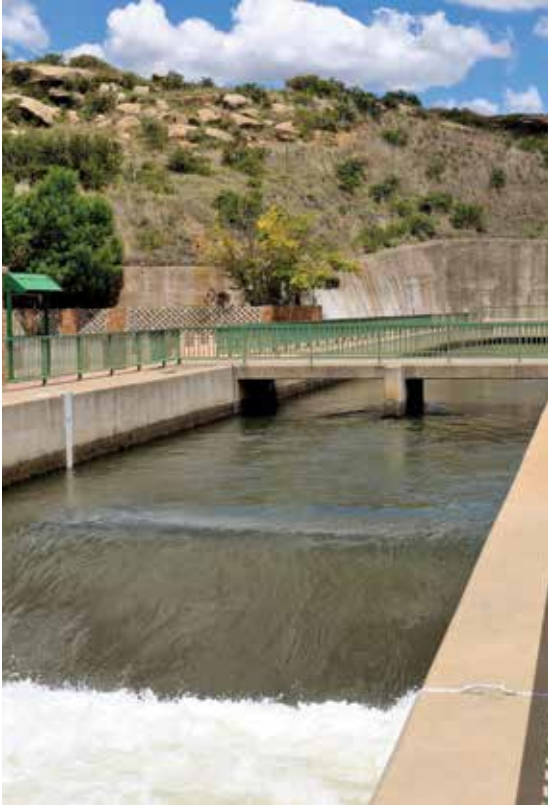


Mohale Dam is built at the confluence of the Senqunyane and Likalaneng Rivers and is part of Phase 1B of the Lesotho Highlands Water Project. At 145m high the Concrete-faced rockfill Dam (CFRD) is also highest in Africa. Construction of the Mohale Dam was aimed at increasing the volume of water to be delivered to South Africa from the 18m³ per second yield of the Katse Dam to 30m³ per second.

THE MOHALE VILLAGE AND MOHALE LODGE OFFER:

A perfect base from which to explore the Maluti Mountains, valleys, dams, rivers, waterfalls and Lesotho's rich cultural heritage, either by road, water or horse/pony trail. Visitors can explore and choose from many activities such as: Kayaking, Boating, Mountain biking, Horse riding, 4x4 trails, Fly fishing, Breath taking scenery for photography.



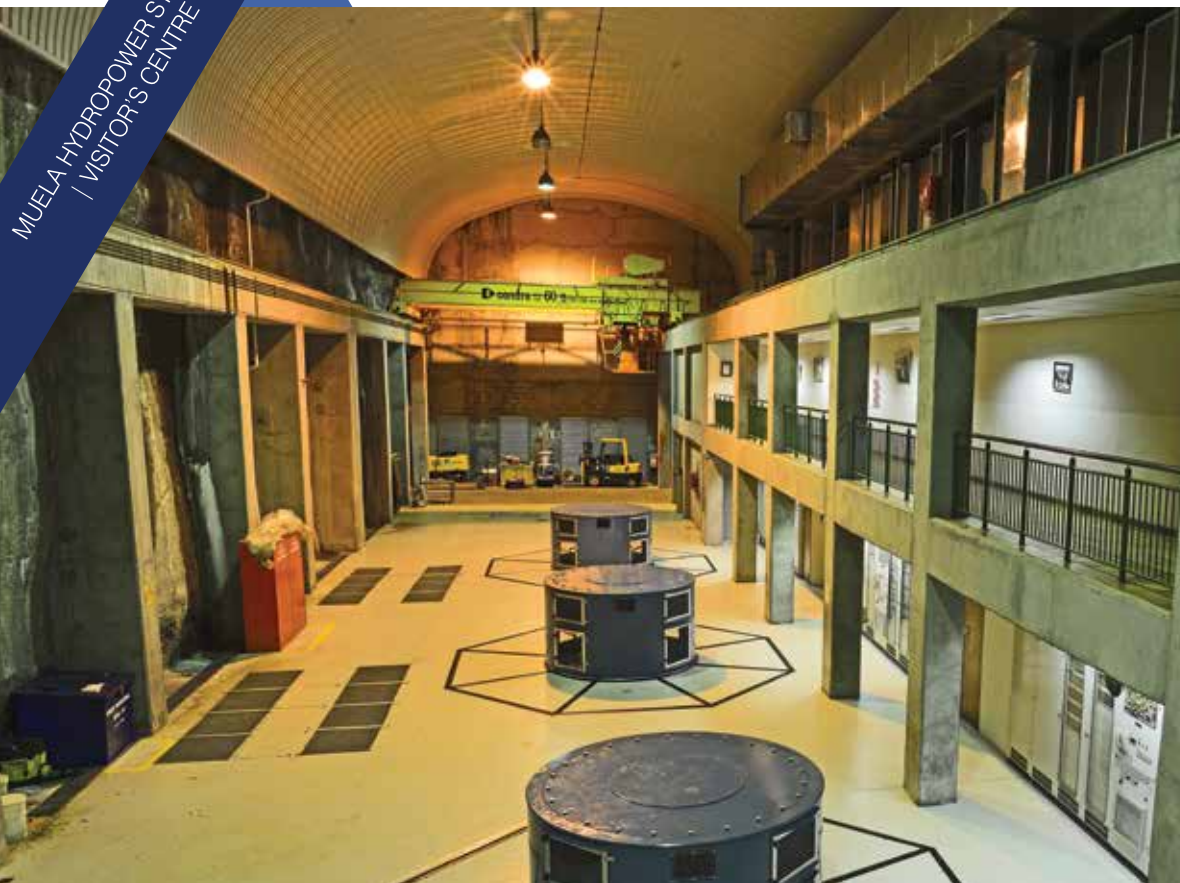


HERE YOU WILL FIND A PLAQUE WITH THE WORDS:
"THE DREAM IS NOW REALITY",
 WHICH DRAWS YOUR ATTENTION TO THE MAGNITUDE AND
 DETERMINATION OF THE DREAMS OF A HANDFUL OF PEOPLE.

THE ASH RIVER OUTFALL

28° 26' 21.8" S 28° 23' 51.02" E

The ASH RIVER OUTFALL, near Clarens in the Free State has become a popular tourist attraction, offering breath taking scenery and is the gateway for water from the LHWP to South Africa. Here, the sparkling water from the LHWP reservoirs surges from the tunnel outlet into the Ash River and onwards to quench Gauteng's thirst. For those seeking adrenaline, the upper reaches of the Ash River offer exhilarating whitewater rafting all year round, whilst the lower reaches feed two wetlands, a birder's paradise for the more relaxed soul. When driving to Lesotho, you can cross the border at either Fouriesburg or Ficksburg in the Free State Province.



'MUELA HYDROPOWER STATION

S 28.7611° E 28.4558°

The hydropower plant at 'Muela was constructed as part of Phase 1A of the Lesotho Highlands Water Project. The major benefit now derived from 'Muela Hydropower Station is that Lesotho generates its own electricity.

Situated in the northern part of Lesotho in the Butha-Buthe District, the station is placed mid-way between the Katse Dam and the Ash River Outfall in South Africa (45km along the 82km long tunnel). At the Station the water from Katse Dam hits the three (3) Francis Turbines that are installed in the powerhouse to generate 72 megawatts of electricity for domestic use. Before the station was built, Lesotho was 100% dependent on South Africa for electricity.

'MUELA TAILPOND DAM

28° 45' 39.9" S 28° 27' 20.5" E

After generation of electricity, water exits into the 'Muela Tailpond, a 55-metre-high dam which provides the headwater for the continuation of water delivery to South Africa. This dam has an intake tower which first takes water into the Delivery Tunnel South which is connected with the Delivery Tunnel North for delivery to the Ash River Outfall at Clarens in South Africa.

Water from the 'Muela reservoir can be released into the Little Caledon River through two outlet valves. The Little Caledon bypass allows water to be diverted down the Caledon River to supply emergency water to the Eastern, Central and Southern Free State, as well as Lesotho border towns during severe drought conditions.



Lesotho is a land-locked country 30 355 km² in extent. It has two distinct landscape types, the western Lowlands and eastern Highlands. The rugged Drakensberg and Maloti ranges form the eastern two-thirds, called the Highlands, creating a high, dissected plateau with an average elevation of about 2 500 metres above sea level (masl) and peaks rising to just under 3 500m. The narrow river valleys are steep-sided; the Highlands landscape is one of deeply incised valleys and peaks. The Senqu (Orange) River drains the eastern and southern sectors and has several large tributaries, including the Malibamat's'o, Senqunyane and Matsoku rivers, which are the locations for most of the Phase 1 LHWP structures.

Highland catchments are characterised by high rainfall, temperate summers and long, cold winters, and they have high water yields due to rapid runoff from the steep slopes. Rainfall occurs predominantly as thunderstorms of high intensity and short duration. The nature of the rainfall and the rapid movement of water off the steep slopes and thin soil results in a quick drainage reaction time. Highly variable, but distinct wet, dry and transitional seasons are identifiable from hydrological records. The wet/rainy season extends from December to March, while the dry season usually extends from June through September.

Grasslands and shrublands dominate highland vegetation; wetlands occur in all drainage lines. Vegetation zones along rivers typically have a higher biodiversity than elsewhere and a higher proportion of woody vegetation, both indigenous and exotic species. Biodiversity has changed through the loss of bogs, reed meadows and marshes, deteriorating rangelands, the loss of mammal and bird species through over-hunting and habitat invasion by humans, as well as by poor management practices. The wild animal communities of Lesotho are distinctive, with several endemic species, but wildlife densities are very low due to heavy, uncontrolled exploitation. Of all the big game previously found in Lesotho, only 5 species remain in isolated mountain areas. Sixteen bird species have become extinct since the 1940s; 176 of the 285 bird species that have been recorded are currently classified as rare. The increase in the number of threatened plant species (45 in 15 years) further strains the biodiversity of the country.



In many respects, the bulk of biophysical impacts of large civil construction projects are generated and experienced during the construction phase, and, provided that site restoration is properly executed, the biophysical environment enters a new 'steady state' during the operational phase. Accordingly, the way in which project impacts are assessed may be different for upstream and downstream areas, and there is always considerable emphasis on the construction phase. These statements also do not apply to the same degree to the socio-economic environment, particularly in cases such as the LHWP, where a massive infrastructure project has been inserted into a remote, technically and economically challenged area. The socio-economic changes that would in all probability emerge would be extensive and would take place over many decades, with the construction phase nevertheless producing the initial, most intense phase of change.

The Environmental Action Plans (EAPs) for Phase 1A and Phase 1B incorporate much of the sustainable development strategy of the LHDA. EAPs for Phase 1A and 1B were compiled and implemented separately, to accommodate the Project construction phase, and geographical situation. With EAPs the LHDA addresses issues related to the management and exploitation of natural resources within the Project area. On the one hand, the presence of large dams holds potential for future aquaculture projects, whilst on the other hand, the impounding of deep valleys eliminates extensive areas of grazing for domestic stock and sources of wood and shrubs used for timber and fuel, thus adding pressure on upland areas due to Project implementation. Resource development projects have thus been included in the Project's sustainable development programmes for different reasons;

- to take advantage of opportunities created by the Project – fisheries and ecotourism
- to mitigate impacts on other resources, such as rangelands and fuel sources – rangeland management and stock improvement and community forestry





The Lesotho Highlands Water Project recognizes that most if not all of communities affected by its implementation, relied on an array of livelihood activities to sustain their everyday lives before they were impacted by the project. However, the development of the project infrastructure has disrupted both the tangible and intangible resources that the people relied on such as the natural resource base, the economic and social networks. One of the significant resources that was lost to the individual households and to the communities is land both rangeland and arable land as a result of the inundation of the dams. The Phase I Compensation Policy had accommodated for land-for-land compensation, thereby allowing for affected communities to continue with their farming practises, wherever possible. However, land for land compensation was not possible due to non-availability of alternative land such that compensation was made in the form of annual grain and pulses or annual cash payments.

Due to rapidly changing topographical and physical landscapes, and societal norms, and as part of lessons learned under Phase I, Project Authorities took cognisance of the fact that; displacement of communities as a result of Project implementation would lead to reduced well-being of the communities that needs to be mitigated through the provision of compensation and implementation of the livelihood improvement programmes to enhance the wealth-creation opportunities for the affected households and communities. Review of the Phase II Compensation Policy was to accommodate for livelihood restoration projects, as a way to engage communities in projects that are potentially sustainable.

The main purpose of the Livelihoods Restoration/Improvement Programme is to optimise the income-generating opportunities for the households and communities within the Project catchment to ensure that the livelihoods of affected communities are sustained and that these communities do not depend of Project Compensation pay-outs.



The implementation of the LHWP required the resettlement and relocation of affected households within the same area or outside their place of origin. The resettled households received new constructed houses constructed to modern standards. Houses were replaced at an equivalent floor space. The process allowed for flexibility in design within accepted parameters.

Phase IA resettles mostly remained in the highlands, whilst Phase IB resettles were given a choice to settle in either the highlands, lowlands or towns. The resettlement process requires integration between resettles and host communities, who in turn received benefit of improved access roads, schools, water supply and sanitation, as well as, access to community development funds.



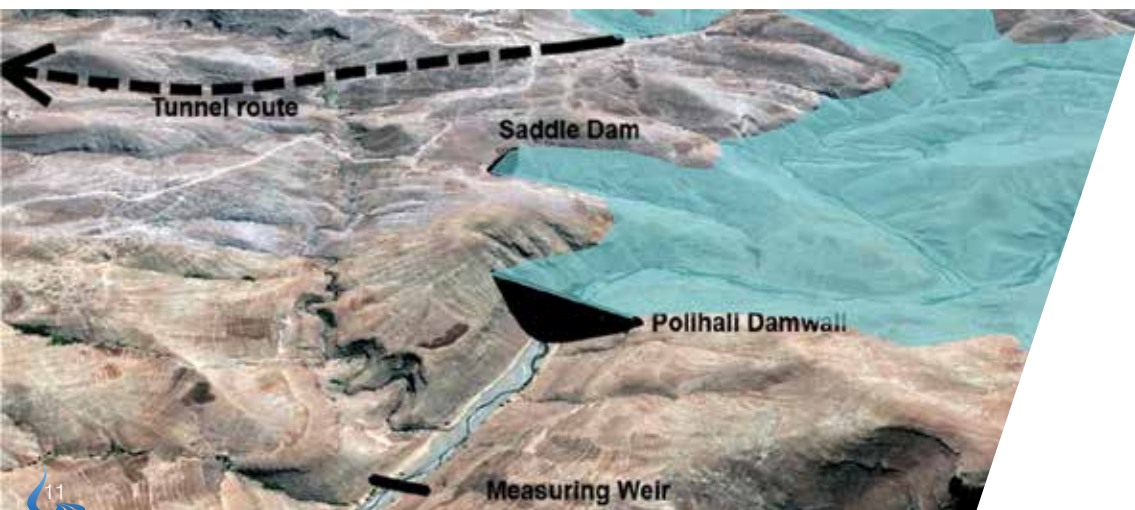


Artistic impressions of the dam

Phase II of the Lesotho Highlands Water Project builds on the achievements of Phase I, which included engineering components; water transfer and hydropower, as well as, social and environmental programmes.

PHASE II WATER TRANSFER COMPONENT

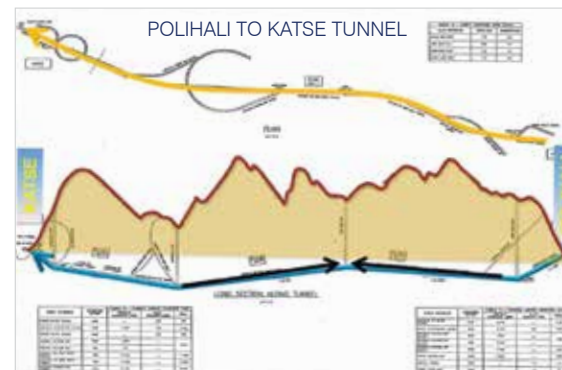
- Two main engineering works – the Polihali dam and Polihali transfer tunnel, and related advanced infrastructure.
- This component will progressively increase the current water supply rate of 780 million cubic metres per annum to 1 270 million cubic metres per annum.



THE POLIHALI DAM AND TRANSFER TUNNEL

The main works of Phase II entails construction of a 163.5 m-high Polihali Concrete-Faced Rockfill Dam (CFRD). The dam, which will have the capacity of 2, 322 million m³, will be built downstream of the confluence of the Khubelu and Senqu Rivers.

The crest length will be 915m, with a full supply level of 2,075m above sea level. Other associated infrastructure will include a 49.5m high saddle dam; a 70m-high metre Polihali Intake Tower and a 38km long conveyance tunnel that will transfer water from the Polihali reservoir to the Katse reservoir.



POLIHALI DAM

- 165m high CFRD high wall
- 49m high CFRD saddle wall
- A side channel spillway
- A compensation outlet with hydropower station of between 3 and 8MW installed capacity
- A low level outlet
- Associated construction infrastructure

POLIHALI TRANSFER TUNNEL

- Intake works and gate shaft at the Polihali reservoir
- A 38km long and 5m diameter water transfer tunnel
- Ventilation and dewatering shafts
- Outlet works and gate shafts at the Katse reservoir with underwater connection to the dam
- Access adits to the waterway
- Associated construction infrastructure

PHASE II HYDROPOWER COMPONENT

The Phase II Agreement states that the hydropower generation component of Phase II would comprise the Kobong pumped storage scheme, or any other similar scheme subject to agreement on the outcome of a joint feasibility study. On-going feasibility studies have confirmed conventional hydropower as the most feasible option for power generation in Lesotho. To this end, the decision was taken to advance the studies to two sites on the Senqu River and one at Oxbow to bankable stage. These studies are expected to be completed by the second quarter of 2019.



- Skiing
- Camping
- Pony Rides
- Hiking
- Fishing
- Motorbike Riding
- Boating
- Bird Watching
- Skydiving

- International Border
- Tarred Roads
- Sand Roads
- 4 x 4 routes
- Dams
- Tunnels
- Nature reserves



AIRSTRIPS WITHIN LHWP AREA

Airstrip name	International Code	Location/District
Bobete	FXBB	Thaba Tseka
Leribe	FXLR	Leribe
Katse	FXKA	Thaba Tseka
Mantsonyane	FXMK	Thaba Tseka
Mokhotlong	FXMK	Mokhotlong
Maseru	FXMM	Maseru
Mejametalana	FXMU	Maseru
Seshote	FXSS	Leribe



HOSPITALS WITHIN LHWP AREA

Name of Hospital	District
Queen 'Mamohato Memorial Hospital	Maseru
Maseru Private Hospital	Maseru
Motebang Hospital	Leribe
Seboche Hospital	Butha Buthe
Paray Hospital	Thaba Tseka



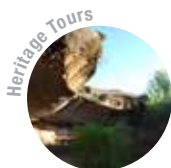
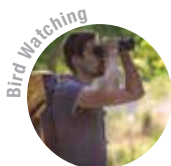
POLICE STATIONS IN THE LHWP AREA

Name of Police Station	Location/District
Police Headquarters	Maseru
Central Charge Office	Maseru
Mohale Police Station	Maseru
Hlotse Police Station	Leribe
Butha Buthe Police Station	Butha Buthe
Katse Police Station	Thaba Tseka



BORDER POSTS

Maseru Border Post	(24hours)
Peka Bridge	(08:00 – 16:00)
Ficksburg Bridge	(24hours)
Caledonspoor Bridge	(06:00- 22:00)
Sani Pass Border Post	(08:00 – 16:00)
Nkokoana Border Gate	(time)
Ramatseiso Border Gate	(08:00 – 18:00)
Qacha's Nek Border Post	(06:00 – 20:00)
Ongeluksnek	(08:00 – 16:00)
Tele Bridge	(08:00 – 22:00)
Makhaleng Border Post	(08:00 – 18:00)
Van Rooyen Border Gate	(06:00 – 22:00)



KATSE DAM

S 29° 19' 53.6 E 028° 30' 36.6

- Tour of both the Katse Fish Farms and Sanlei Trout
- Homestays
- Pony riding
- Hiking
- Boating
- Fly fishing at Makhangoa
- Camping
- Bird Watching
- Tour of the Katse Botanical Garden (for endemic and Alpine plant species)
- Fishing

DIRECTIONS TO KATSE

From Ficksburg border post, follow the tarred road to Hlotse. Turn to the right and enjoy a comfortable 120km Nelson Mandela Road, through the impressive hair-pin bend situated at more than 3000 metres above sea level to Katse dam site.

MOHALE DAM

S 29° 27' 43.6 E 028° 06' 20.8

- Guided tour of the Mohale Dam
- Home Stays
- High Altitude Training Facility at Ha Rapokolana
- Boating
- Fishing

DIRECTIONS TO MOHALE

To get to Mohale, follow the tarred road from Maseru to Roma-Mohale intersection.

Turn left and follow the road over Bushmen's, God-help-me and Blue Mountain passes to Mohale village.

Drive past the village for 11km to the Mohale Information Centre and access the dam site and information office.

MOHALE LODGE

S 29° 27' 43.6 E 028° 06' 20.8

The Mohale village and Mohale Lodge offers:

- A perfect base from which to explore the Maloti Mountains, valleys, dams, rivers, waterfalls and rich cultural heritage, either by road, water or horse/pony trail.
- Kayaking, Boating, Mountain Biking, Horse Riding, 4x4 Trails, Fly Fishing, Visitors' Centre and Breathtaking Scenery.
- A photographic paradise!

+266 2293 6134

res.mohalelodge@lhda.org.ls

rec.mohalelodge@lhda.org.ls

'MUELA DAM

S 28.7611° E 28.4558°

- Guided tours to the 'Muela Dam
- Viewing the cultural heritage site in Liphofung
- Visiting the birth place of King Moshoeshoe 1

DIRECTIONS TO 'MUELA VISITORS CENTRE

'Muela Visitors Centre is situated below the Operations Building of 'Muela Hydropower Station.

The centre is about 30 km from Butha-Buthe and 35km from Caledonspoort border post.

Off the main road to Oxbow and Afri-Ski, the centre is 6km.

TŠEHLANYANE NATURE RESERVE – CAMPING

29.3216° S, 28.1141° E

- Hiking
- Visits to the Tšehlanyane Adit
- Enjoying the beautiful scenery around Tšehlanyane with the 5-star Madiba Lodge
- Faunal sightings Picnicking

BOKONG VISITORS CENTRE

S 29° 04' 17.2 E 028° 25' 31.9

- Hiking to the Lepaqoa Falls
- Bird Watching at the view point overlooking the Pitseng Valley
- A look at the Lesotho Fauna that is nearing extinction

ASH RIVER OUTFALL

28° 26' 21.8" S 28° 23' 51.02" E

- Viewing the entrance of water from the LHWP to South Africa
- Rowing/Boating/Kayaking

KATSE LODGE

S 29° 19' 50.56" E 028°28' 52.14"

+266 229 10202

rec.katselodge@lhda.org.ls

res.katselodge@lhda.org.ls

LEJONE CAMP/MOTEBONG LODGE

S 29° 27' 43.6 E 028° 06' 20.8

Self-catering and serviced accommodation

High-altitude training camp

Hiking trails

Boating

Pony trekking

Fly fishing

Arts and crafts

MAKHANGOA FLY-FISHING CAMP

29° 16' 54.4" S 28° 23' 04.5" E

- Fly-Fishing
- Camping



Katse Information Centre
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+266 229 10002

Mohale Information Centre
+266 229 36217 | +266 229 36219

Muela Information Centre
+266 2224 8000

Head Office Maseru Information Centre
+266 222 46000



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 **Lesotho Highlands Water Project**