Concept for Phase B Rapid Catchment Rehabilitation Measures

1 Context

ReNOKA follows a phased approach to the rehabilitation of Lesotho's degraded catchments. Rolling out of rehabilitation measures takes place within an enabling framework that is progressively built through strengthening policy and legal framework to ensure institutionalization of ICM in Lesotho, building strong ICM institutions with capacity for sustainable ICM, strengthening awareness, knowledge, and skills of ReNOKA stakeholders for sustainable ICM and supporting the Government of Lesotho in providing overall management of ICM.

In the first phase, capacity development for ICM started in priority sub-catchments where degradation was most severe and loss of potentially productive capacity of the land. **Phase A** of "Fast track" measures to stop and slowly reverse further damage to the catchments were implemented at seven hotspots in four sub-catchments with support from contractors using labour-intensive work measures. In parallel, new ICM institutions were established from the ground up and capacitated to conduct ICM planning with communities to develop and test a local planning-implementation-monitoring cycle.

Whether rapid rehabilitation measures are implemented, or the community develops watershed rehabilitation plans implemented by community councils, each degraded watershed is approached with a holistic "Peak to Valley" assessment and identification of carefully selected, unique combination of measures to address root causes of degradation and water and food insecurity issues in the watershed.

Phase B of the rapid rehabilitation will:

1. Be working with existing Community Watershed Teams (CWTs) and expand rehabilitation adjacent / downslope of Phase A hotspots to consolidate and multiply impacts achieved in Phase A
2. Address new hotspots. The consultant (see ToR) will visit the locations, propose specific measures for each location, and design the interventions. During inception, proposed interventions will be discussed with the client before the consultant proceeds with designs.
3. Improve the catchment rehabilitation approach by introducing voluntary community contributions, technical support contributions by GoL (CPUs), and the private sector. (The Phase A approach was purely based on contractor-led labour-intensive works.)

2 Overview of Phase B interventions

Table 2-1 provides a summary of the Phase A and Phase B sites. Locations of the sites are shown in Figure 2-1. Chapters 3 to 10 provide brief descriptions of the interventions that are envisaged at each of the Phase B sites.

Table 2-1 : Summary of Phase A and Phase B Sites

Site	Phase	Code	Latitude	Longitude	Construction Lot	Remarks
Ha Khabo 1A	A	CC04_01	-28.87083	28.27156	1	Completed
Ha Khabo 2A	A	CC04_02	-28.86419	28.26350	1	Completed
Ha Lenonyane	A	CC55_01	-29.60863	27.27788	3	Completed
Ha Mohlalefi Diversion	A	CC55_02	-29.58740	27.33255	3	Completed
Ha Mohlalefi Pump	A2	CC55_02	-29.58509	27.30398	3B	In procurement
Ha Potiane	A2	MC32_01	-29.61288	27.76138	3	In procurement
Pae-lea-Ithlatsoai	A2	SC07_01	-29.01940	28.94174	2	In procurement
Ha Khabo 1B	B	CC04_01B	-28.86646	28.27208	-	To be designed
Ha Khabo 2B	B	CC04_02B	-28.86255	28.26267	-	To be designed
Ha Lesala / Ha Phallang	B	SC39_01	-29.82967	28.02149	-	To be designed
Ha Mohlalefi Quarry	B	CC55_02B	-29.58588	27.33245	-	To be designed
Ha Moitsupeli	B	MC32_02	-29.59760	27.76625	-	To be designed
Ha Ramarathole Solar PV	B	CC71_01	-29.81087	27.32822	-	To be designed
Puete Wetland	B	MC32_03	-29.59328	27.73605	-	To be designed
Ts'a Kholo	B	CC71_02	-29.66184	27.15968	-	MFSRC designs to be reviewed

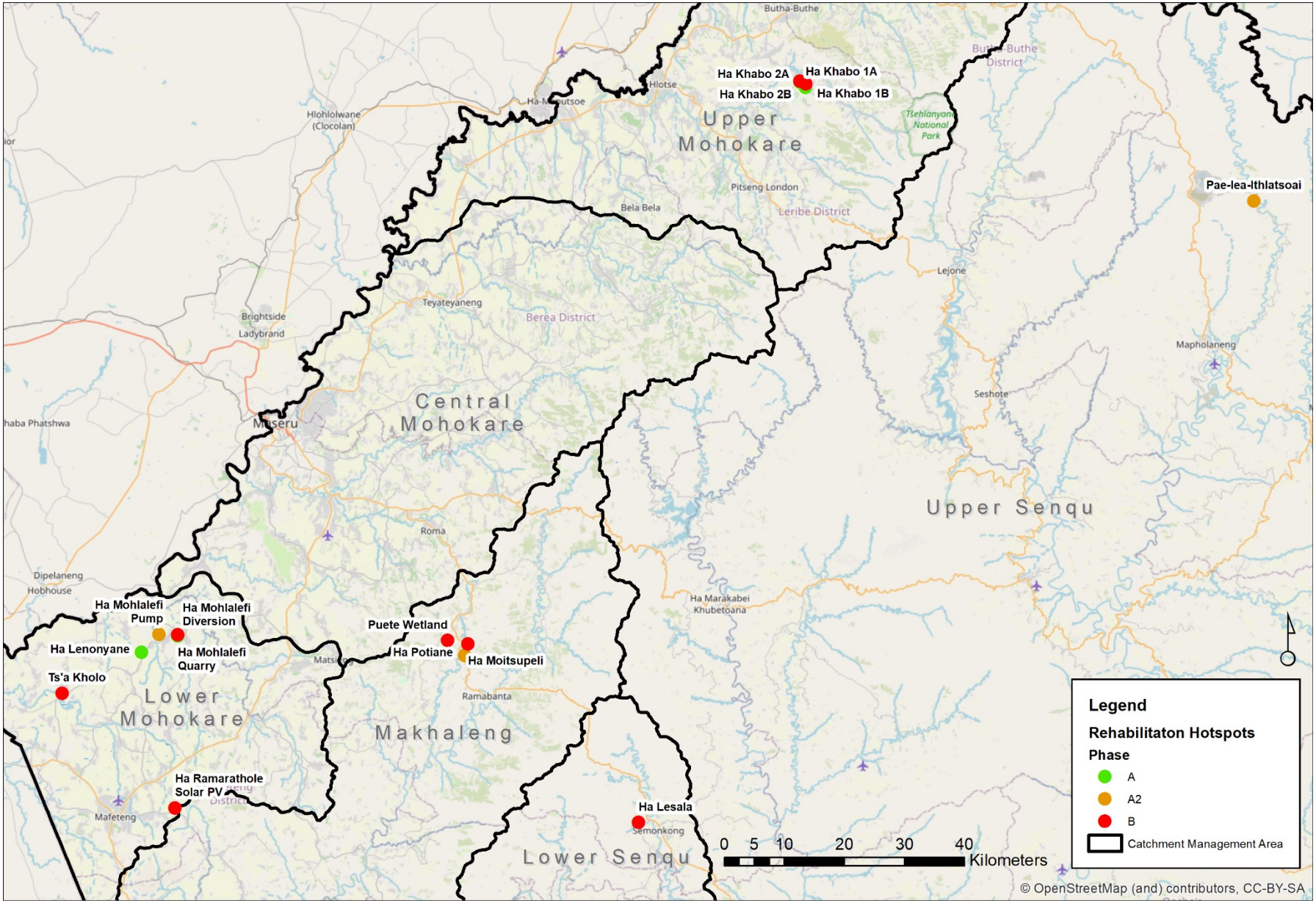

Figure 2-1 : Overview of Phase A and B ICM implementation sites

3 Ha Mohlalefi Quarry Diversion

3.1 Site description

The whole area is water insecure. Near the village of Ha Mohlalefi is an old quarry that had been used as a borrow pit for road construction. In Phase A, a gabion weir and a stone masonry canal were constructed to divert water from a stream into a quarry to provide non-potable water for livestock, washing, etc.

Diversion weir and canal

Diversion canal

Figure 2: Shows an overview of Ha Mohlalefi Quarry

3.2 Phase B Interventions

3.2.1 Location

Figure 3-1 : Aerial view of Ha Mohlalefi

3.2.2 Implementation approach

The objectives of the Phase B measures are to provide safety measures (fencing, safe water abstraction point, water quality testing) around the small diversion weir, and along the quarry perimeter. In addition, erosion control and stormwater management measures are needed in the small catchment upstream of the diversion weir.

The Phase B implementation approach is summarised below.

Table 3-1 : Ha Mohlalefi Implementation Approach

Measure(s)	**Implementation by**
Design and specification	GIZ service provider
Water quality testing,	DWA / UFS WQ laboratory
Water treatment, safety measures around the quarry, water abstraction point	Contractor using community labour (GIZ contract).
Monitor water diversions and water levels in the quarry to establish reliable yield	Guided by GIZ and ICU, CWT starts a monitoring programme.
Erosion and stormwater control upstream of diversion weir	Voluntary community labour, organised through CWT with technical support from CPU

Quarry fencing and access

Area for stone bunds / check dams

Weir fencing

Area for stone bunds / check dams

Figure 3-2 : Ha Mohlalefi Intervention Areas

4 Ha Ramarathole Solar PV Farm

4.1 Site description

The Mafeteng Ha Ramarothole Solar PV Park is a 70MW solar PV power project. The first phase has been completed. The project will be developed in multiple phases, eventually covering 220 hectares. The project is being developed by TBEA Xinjiang New Energy and operated by the Lesotho Electricity Generation Company (LEGCO). The western side of the farm is threatened by gulley erosion with the foundations of some of the solar panels already undercut by erosion. The developer has approached the ICU to request assistance in rehabilitating the degraded watershed to halt the erosion. The site is characterised by highly erodible duplex soils, and will require careful selection of erosion control and stormwater management measures.

Gulley erosion

The solar farm

Figure 4-1 : Ha Ramarathole Intervention Areas

4.2 Phase B Interventions

4.2.1 Location

Latitude -29.811067 S, Longitude 27.324959 E.

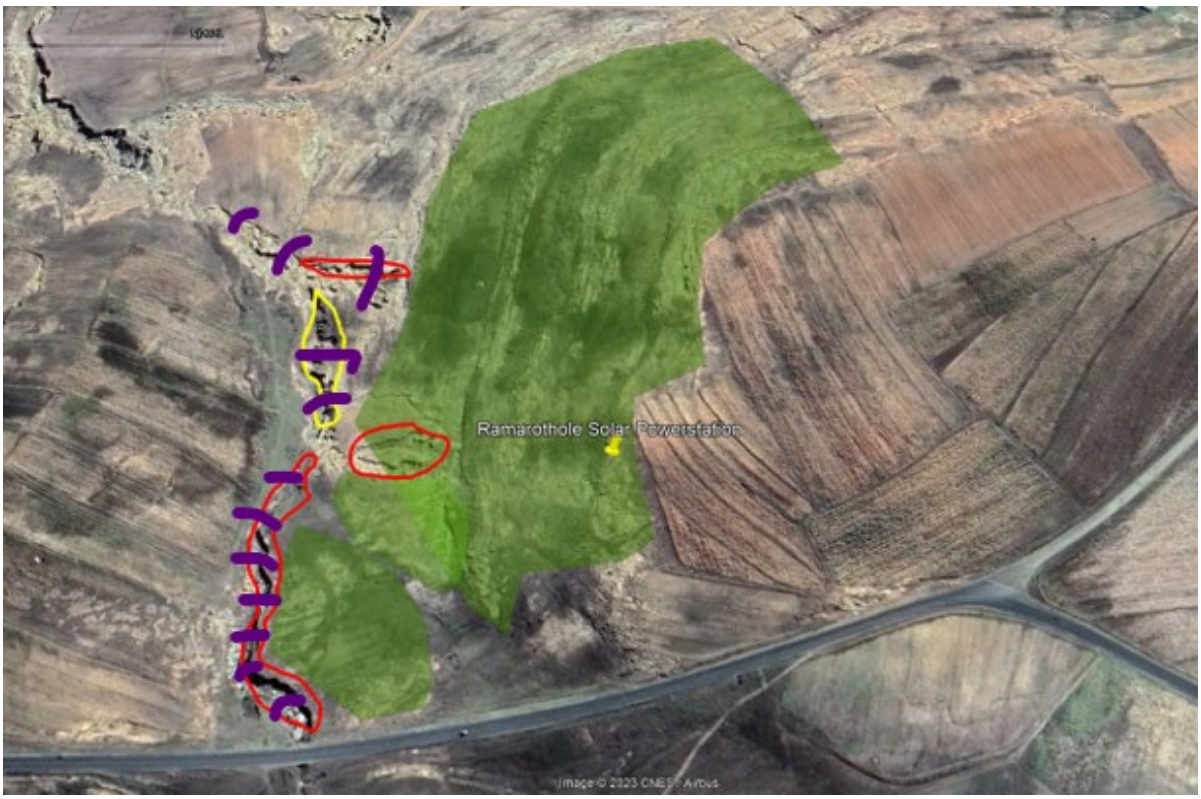

Figure 4-2 : Aerial view of the Ha Ramarothole PV Farm

4.2.2 Implementation approach

Within the solar farm, LEGCO envisages that erosion and stormwater control measures; gully head stabilisation (In yellow), gully reshaping (in red), check dams (in purple) and revegetation (in green) will be implemented to curb further gully erosion development.

It is important that degraded areas in the catchment upstream of the solar farm be rehabilitated to improve water retention and infiltration, and to reduce the impact of storm events at the solar farm. It is anticipated that the ICM Programme will address interventions in the upstream catchment, while LEGCO and its service providers and contractors will implement measures in the solar farm.

The Phase B implementation approach is summarised below.

Table 4-1 : Ha Ramarathole Implementation Approach

Measure(s)	**Implementation by**
Design and specifications (Solar Farm)	LEGCO and partners
Design and specifications (Upstream catchment)	GIZ service provider
Erosion and stormwater control measures in the solar farm ICM measures upstream to control run-off	LEGCO contractor ICM either engages a contractor implementing labour intensive works, or Community Watershed Team implements the work.
Construction supervision	GIZ site engineers
Establishment of a Community Watershed Team	Catchment Manager

5 Ha Khabo catchment rehabilitation and improvements to water security

5.1 Site description

The site is located south-east of the village Ha Khabo. The area is moderately steep with slopes ranging from 10 to 20%. The area is heavily eroded and consists of very deep gullies of about 10- 20 metres deep downstream of the micro-catchment. Duplex soils are highly erodible. The water from the upper reaches of the micro-catchment flow freely with great velocities as the sandstone rock has been exposed with no vegetation. In Phase A, the upper parts of the watershed have been stabilised with a range of measures, including reshaping of a road that was concentrating flows and causing erosion, stormwater management, construction of drifts, rehabilitation of terrace bunds, construction of stone bunds and gully head stabilisation.

Road reshaping and stormwater management

Drifts and stormwater disposal

Figure 5-1 : Phase A rehabilitation measures at Ha Khabo

5.2 Phase B Interventions

5.2.1 Location

-28.87083 (S) 28.27156 (E)

South-east of the village Ha Khabo. (Phase A measures are shown on the figure below.)

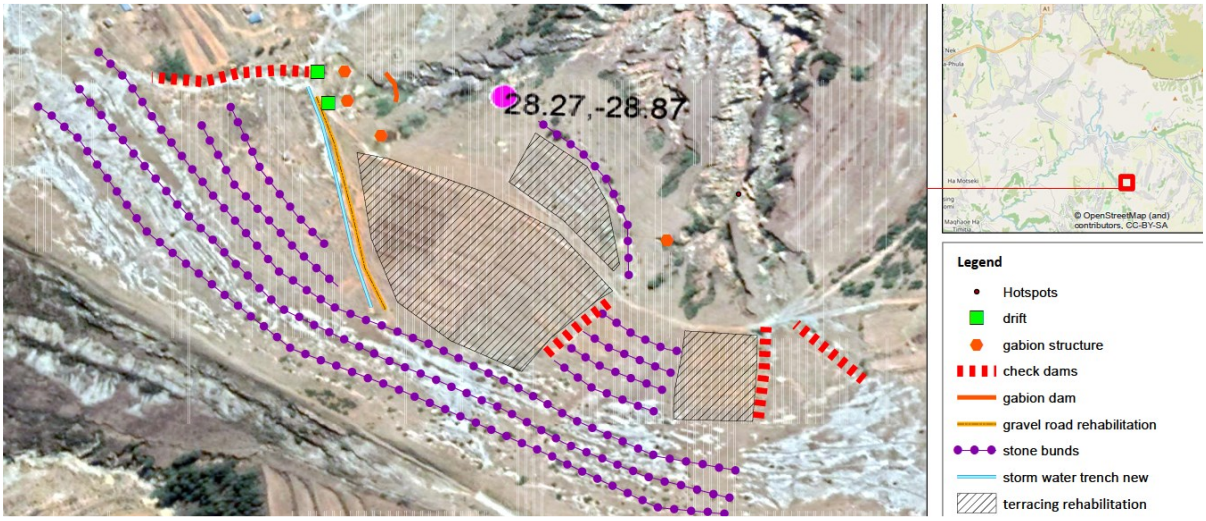

Figure 5-2 : Aerial view of Ha Khabo and Phase A measures

5.2.2 Implementation approach

In Phase B, work will move further downstream / downslope. Heads of major gully arms that are cutting into cultivated land will be stabilised. Improved groundwater baseflow in the upper watershed will be utilised by protection of three springs, collection of the water with a pipe network and storage in water tanks.

The Phase B implementation approach is summarised below.

Table 5-1 : Ha Khabo catchment implementation approach

Measure(s)	Implementation by
Design and specifications	GIZ service provider, Leribe Department of Rural Water Supply (spring protection and water collection / storage)
Gully head stabilisation, erosion and stormwater control measures	Contractor using paid community labour (GIZ contract).
Construction supervision	GIZ site engineers
Establishment of a water management committee under the CWT, establishment of a village water supply maintenance fund.	CWT, Catchment Manager

Gulley arms cutting into cultivated fields

Spring downslope of rehabilitated upper watershed

Figure 5-3 : Gully arms amidst cultivated fields and spring downslope of the rehabilitated upper watershed

6 Ha Khabo small irrigation scheme

6.1 Site description

The site is located south of the village of Ha Khabo, in the watershed adjacent to the watershed described in Section 5. A local initiative led by a former Member of Parliament has built a small earth dam, established a fruit tree orchard, and fenced off this area a few years ago. Existing farm terraces were meant to produce fodder crops that can be harvested by the local villagers for feeding their livestock. The dam used to supply a small-scale irrigation scheme in a greenhouse further downstream that was run by the local youth club. Unfortunately, the whole scheme has been neglected and somewhat fallen apart with the fence having been destroyed, livestock being taken into the area, burning of the slopes, vandalism of the greenhouse and the irrigation scheme not being in use anymore.

In Phase A, the dam wall was raised, and the spillway enlarged for dam safety purposes. The dam has raised water levels in the upstream wetland and has controlled erosion downstream where a gully below has stabilized. Erosion on the upper slopes of the watershed was protected and stabilised with construction of stone check dams.

Raising of the small earth dam

Disused greenhouse

Figure 6-1 : Small earth dam and an unutilized greenhouse at Ha Khabo

6.2 Phase B Interventions

6.2.1 Location

-28.86419 (S) 28.2635 (E)

South of the village of Ha Khabo.

Figure 6-2 : Phase A measures south of the village of Ha Khabo

Figure 14: Shows Phase A measures south of the village of Ha Khabo

6.2.2 Implementation approach

In Phase B, improved water yield from the raised earth dam will be used to re-establish the small-scale irrigation scheme. The existing CWT and certified community service providers (marketing agents) will establish a small farmer's co-operative (pre-condition) to operate and maintain the irrigation scheme.

The Phase B implementation approach is summarised below.

Table 6-1 : Ha Khabo irrigation implementation approach

Measure(s)	**Implementation by**
Design and specifications	GIZ service provider, Leribe MoA (drip irrigation scheme)

Measure(s)	Implementation by
Rehabilitation of irrigation water distribution system and greenhouse	Contractor using paid community labour (GIZ contract).
Construction supervision	GIZ site engineers
Establishment of a co-operative under the CWT, establishment of a maintenance fund.	CWT, Community Service Providers, Catchment Manager, GIZ Livelihood Adviser

7 Puete Wetland rehabilitation

7.1 Site description

Puete wetland is in a tributary watershed of the Makhalaneng River, about 4 km south of the village of Ha Moitsupeli. The Puete watershed is the main source of water for Ha Moitsupeli. The wetland has been severely degraded due to overgrazing on the hillslopes above the wetland. This has led to loss of rangeland in the upper watershed, uncontrolled stormwater runoff from the steep slopes and erosion and loss of peat soils in the wetland.

Gully head upstream of Puete

Gully head along the stream of Puete

Figure 7-1 : Gully head and erosion along the Puete Wetlands/Stream

7.2 Phase B Interventions

7.2.1 Location

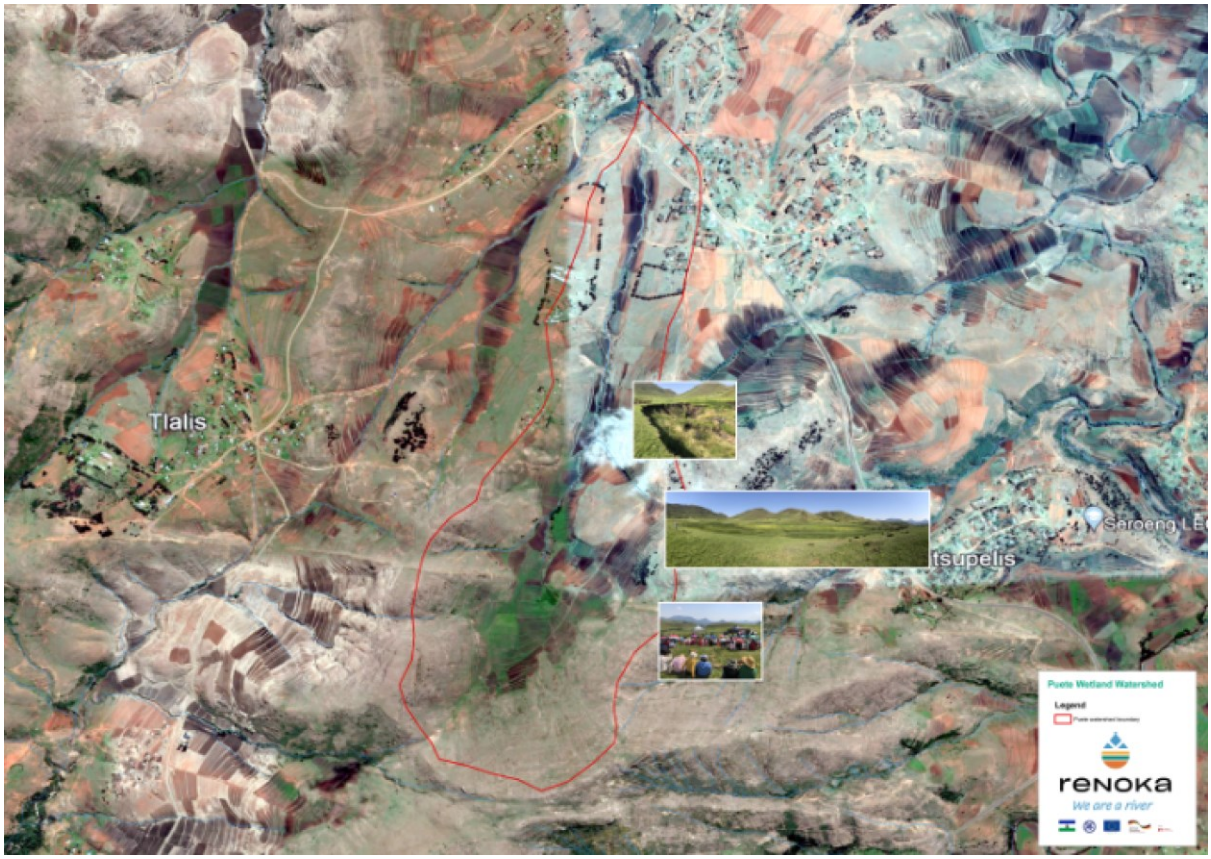

Figure 7-2 : Aerial view of the Puete catchment and wetland

7.2.2 Implementation approach

The Puete Community Watershed Team has cleared the upper slopes of the catchment of invasive shrubs and stacked the cut shrubs along contours. The degraded rangeland is recovering, and, if managed properly, will in the long term reduce the volume and intensity of storm water runoff. In Phase B, the large gully system in and downstream of the wetland will be stabilised to further aid healing of the erosion scar. Hard structures (eg. stone check dams and gabions) are not likely to work in the deep peat soils, and interventions should focus on reshaping, revegetation, and green (vegetative) erosion and stormwater control measures.

In the past, the Puete stream served as the source of piped water for the Ha Moitsupeli community in the adjacent micro-catchment. Water intake structures were undercut and washed away in past storm events. After erosion control and stormwater management measures have been designed, a new, water intake location will be identified, and protection measures designed. The Department of Rural Water Supply will be engaged to develop designs to rehabilitate the water supply system.

The Phase B implementation approach is summarised below.

Table 7-1 : Puete wetland implementation approach

Measure(s)	**Implementation by**
Design and specifications of gully rehabilitation measures	GIZ service provider
Identification of a new water intake location and protection measures	GIZ service provider

Measure(s)	Implementation by
Design and specifications of a rehabilitated water supply system	Department of Rural Water Supply
Gully head stabilisation, erosion and stormwater control measures such as terracing and level bunds may be relevant here. Additionally, revegetation with indigenous grass/fodder plants and perhaps the introduction of community managed rangeland management with local bylaws including rotational grazing, cut and carry system, management and safeguarding of the rangeland for sustainable use	Contractor using paid community labour (GIZ contract).
Rehabilitation of the Ha Moitsupeli water supply system	Contractor using paid community labour (GIZ contract), To be confirmed.
Construction supervision	GIZ Engineers

8 Ha Moitsupeli catchment rehabilitation

8.1 Site description

Moitsupeli catchment is on the North-east of the Puete wetland. This catchment is exposed to the danger of wetlands cultivation, overgrazing and erosion caused by stormwater from road infrastructure. The community has expressed interest for developing a small irrigated orchard on the banks of the Makhalaneng River.

Figure 8-1 : Location of the proposed fruit orchard

Figure 8-2 : Examples of eroion in the micro-catchment

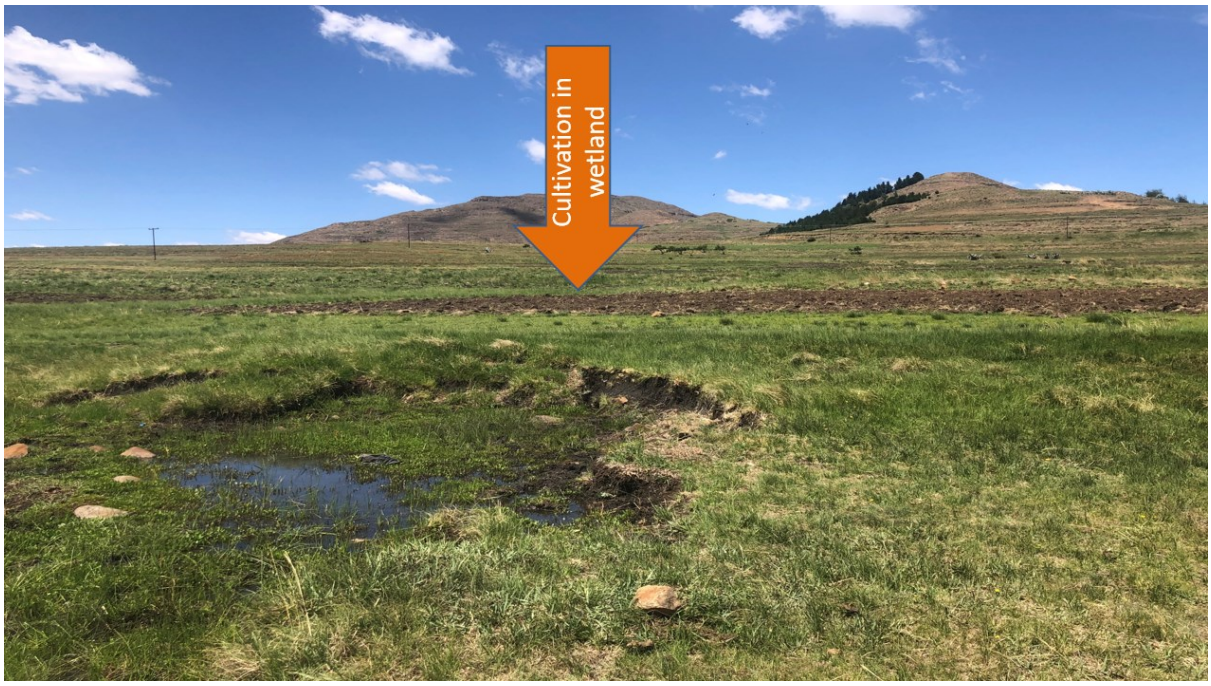

Figure 8-3 : Wetland encroachment

8.2 Phase B Interventions

8.2.1 Location

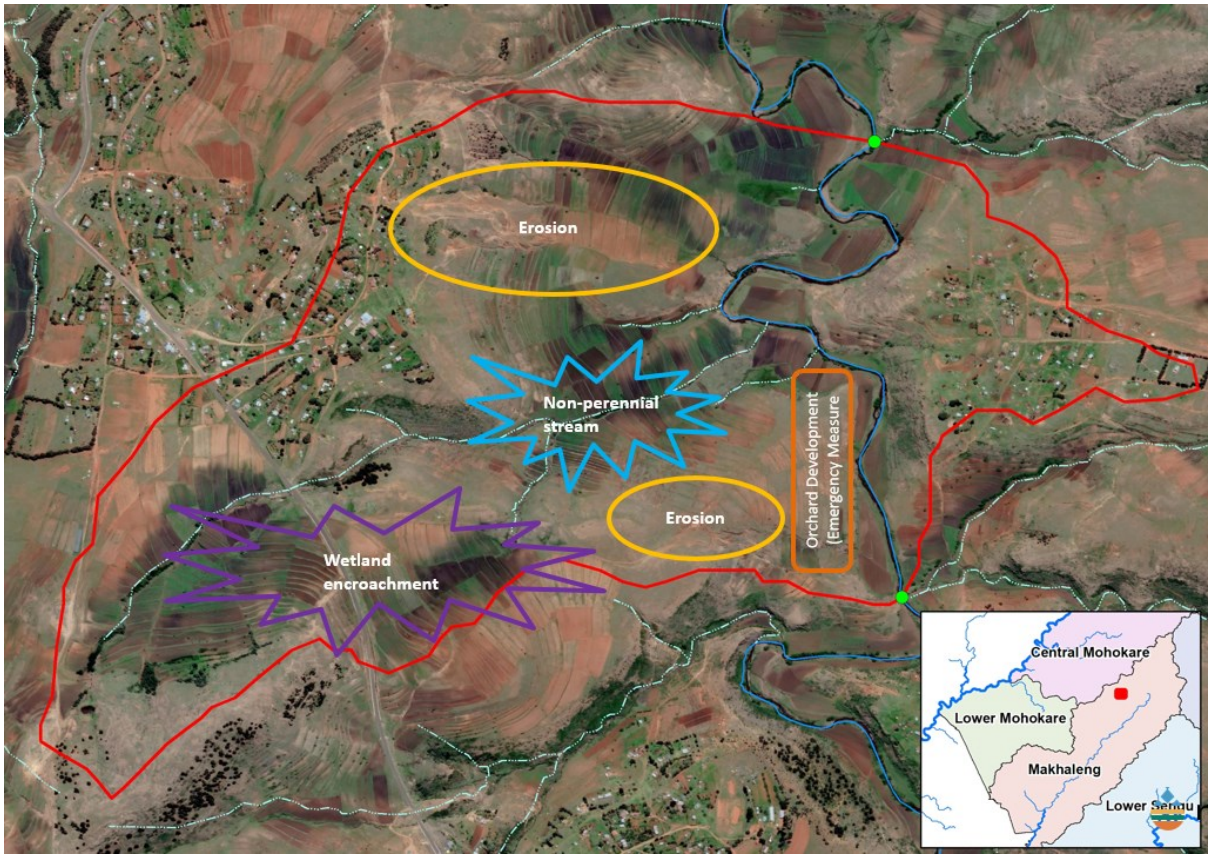

Figure 8-4: Ha Moitsupeli catchment and degradation hotspots

8.2.2 Implementation approach

In Phase B, the Community Watershed Team will be engaged to address causes of degradation (wetland encroachment, overgrazing, cultivation in the floodplain and water courses) in tandem with implementation of physical measures for erosion control and stormwater management. In exchange for voluntary community work to implement simple erosion control and stormwater management measures, the community could be supported to establish an irrigated orchard scheme. It may be an option for the existing CWT and certified community service providers (marketing agents) to establish a small farmer's co-operative to operate and maintain the irrigation scheme.

The Phase B implementation approach is summarised below.

Table 8-1 : Ha Moitsupeli Implementation Approach

Measure(s)	**Implementation by**
Design and specifications of physical rehabilitation measures	GIZ service provider
Gully head stabilisation, erosion and stormwater control measures	Simple measures: • Community Watershed Team (labour), Catchment Planning Unit (technical advice). Complex measures: • Contractor using labour intensive methods (GIZ contract)

Measure(s)	Implementation by
Construction supervision	GIZ Engineers
Establishment of a co-operative under the CWT, establishment of a maintenance fund.	CWT, Community Service Providers, Catchment Manager, GIZ Livelihood Adviser

9 Ha Lesala / Ha Phallang Water Supply

9.1 Site description

The site is west of Semonkong town and North of Ha Lesala village. The area is flat to steep with slopes ranging from 5 to 30%. At the lowest point of the area is a spring that still produced some water at the end of the dry season. The area is resourced with plenty of wetlands and good black mountain soils suitable to produce potatoes. Major causes of degradation are due to poor management of wetlands and rangelands that are being over-grazed by large numbers of livestock i.e. goats and sheep. The wetlands are destroyed by horses and donkeys.

Deep gullies such as those found in the Foothills and Lowlands are non-existent in the area. The soils in this area are more clayey and contain considerable amount of organic matter. Invasive plants are found in the rangeland, rill erosion and destruction of terraces as well as the scratching of land above 20% slopes is happening. Exposed bare rock occupies a significant area upslope of the catchment.

Figure 9-1 : Phallang village located on a spur between the Maletsunyane River and a small tributary (foreground)

Figure 9-2 : Valley which has been considered as a water source (springs) for Ha Phallang

9.2 Phase B Interventions

9.2.1 Location

9.2.2 Implementation approach

The Community Watershed Team has been implementing catchment rehabilitation measures on a voluntary basis, and with some support from Covid-relief funds. The objective of the Phase B support is to identify and assess a range of options to provide the nearby Ha Phallang village with safe drinking water. A previously considered option is to implement a solar (or wind powered) pump, pipeline and reservoir system. Considering the small number of village inhabitants, this scheme may not be cost efficient and sustainable.

The Phase B implementation approach is summarised below.

Table 9-1 : Ha Phallang Implementation Approach

Measure(s)	**Implementation by**
Identification of water source for Ha Phallang water supply. Conceptual design	GIZ service provider
Design of the water supply scheme.	Department of Rural Water Supply, GIZ service provider
Construction of water supply scheme	Contractor using labour intensive methods (GIZ contract)
Construction supervision	GIZ Engineers

10 Ts'a Kholo / Bophelo Bioscience / Mafeteng Special Economic Zone

10.1 Site description

The Ts'a Kholo sub-catchment is in the Mafeteng District. The district is designated as a special economic zone to attract investment and foster economic growth. Water security and reduction of soil erosion are key for Mafeteng's continued economic growth and industrial development. Dams are an important part of the response to managing water under conditions of scarcity. They serve to capture and store surface runoff for productive purposes, including drinking and industrial water supply, irrigation as well as improving flood management and moderating the negative impacts of droughts. Uncontrolled water runoff has caused soil erosion, development of dongas and silting of dams. The Ts'a Kholo Dam which provided irrigation water for Bophelo Bioscience (pharmaceutical cannabis) has silted up completely due to failure of an upstream dam and transported sediment from other parts of the catchment.

10.2 Phase B Interventions

10.2.1 Location

Figure 10-1 : Downstream part of Ts'a Kholo subcatchment near Bophelo Bioscience (Ts'a Kholo Dam at the bottom of the image)

10.2.2 Implementation approach

A public-private partnership between the ICM Programme, Bophelo Bioscience, Ministry of Forestry, Department of Soil and Water Conservation and the Mafeteng Special Economic Zone (MCEZ) to build resilience and improve water security in the Ts'a Kholo subcatchment.

Provisional partner contributions in the cooperation are as follows:

ICU with GIZ support:

- Contribute to the identification of improved land use practices (major causes of erosion through comprehensive community engagement to improve natural resource management in the catchment through bottom up ICM planning.
- Planning with CPUs to identify and locate and cost specific rehabilitation measures in the upstream catchment as specified in the Compendium for Soil and Water Conservation measures
- Development of Community Council ICM plans with measures to maintain the sustainability of investments
- Development of By-laws to safe-guard investments
- Explore the possibility of replacing in-channel dams with off-channel storage to reduce environmental impact.

- Funding of additional assessment to inform feasibility of dam rehabilitation measures:
- Funding of specialist flood and catchment hydrology studies to inform dam and spillway sizing, and to determine yield and supply from the dam.
- Planning with CPUs to identify and locate and cost specific rehabilitation measures in the upstream catchment

Ministry of Forestry Department of Soil and Water Conservation:

- In kind contribution to studies by mobilizing the department technical expertise
- Contribution towards development of ICM plans through technical expertise
- Contribution towards implementation of ICM measures, and rehabilitation of dams

Bophelo Bioscience and Mafeteng SEZ

The MSEZ recognizes the need for a large-scale renovation of the Ts'akholo dam and the dams upstream from the source. The MSEZ will source funds from the World Bank and expertise from other organizations to begin to address the needs for this project.

As a first contribution from the ICM Programme, GIZ will use the services of a catchment rehabilitation specialist (design engineer) to review a draft rehabilitation plan that was developed by the Ministry of Forestry – Department of Soil and Water Conservation, to identify specialist follow-up studies that may be needed, and to develop draft terms of references for these studies.