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1. INTRODUCTION

The Lower Usuthu Smallholder Irrigation Project (LUSIP II) was classified as a category 3 project in accordance with the Environmental Audit, Assessment and Review Regulations, 2000. According to these regulations, a category 3 project requires a full Environmental Impact and social impact Assessment (ESIA). The ESIA has identified potential environmental impacts that may arise as the project is being implemented. These are both negative and positive. It has been the subject of a comprehensive Environmental and Social Impact Assessment (ESIA) in accordance with prevailing Ethiopian policies, laws and guidelines. The ESIA has identified a number of potential adverse environmental and social impacts associated with the project and has developed mitigation measures for these.

Accompanying the ESMP is the Resettlement Action Plan (RAP) (This has been prepared by the Resettlement Specialist). The elements of this plan are outlined in the ESMP, but the RAP is presented as a separate report accompanying this report.

During preparation of the ESMP, the exact timelines of the project had not been specially determined. As such, the timelines proposed are not specific. During implementation, these timelines would need to be clearly specified and agreed upon by all stakeholders involved in its implementations. Some of the measures outlined in the ESMP require the participation of stakeholders who may have different priorities, which may affect the timelines in the implementation of those mitigation measures.

This ESMP was prepared to fully comply with environmental legislations, policies and procedures in Swaziland and in line with the ADB and World Bank environmental and social safeguard policies. These are alluded to in the ESIA report and therefore this report should be read in conjunction with the ESIA report.

1.1 Objective and Scope

The main objective of the Environmental and Social Management Plan (ESMP) is to outline measures to be taken to mitigate potential negative impacts and enhance positive impacts identified in the ESIA. The ESMP is a tool that would ensure sustainability of the mitigation of adverse impacts. Another key aspect to the compliance of the project is that of ensuring that the mitigation measures CMP are adhered to. This is done through regular monitoring and compilation of project compliance reports (PCRs) which should be submitted to the SEA. It is important that all tender documents include clauses that empower SWADE to withhold final payment to contractors if the environmentalists monitoring the CMP are not satisfied with that contractor's environmental compliance.

1.2 Structure of the ESMP

Chapter 2 lists the predicted potential impacts

Chapter 3 presents the core of the ESMP in the form of two sub sections standardised tables, covering the Pre-construction/Construction and Operational Phases. There are estimated costs associated with proposed mitigation.

Chapter 4 introduces the Resettlement plan, which is presented separately as Volume 3.

Chapter 5 sets out the proposed monitoring programme.

Chapter 6 outlines the recommended institutional arrangements for ESMP implementation.

Section 7 identifies estimated costs.

Conclusions and Recommendations are presented in the last chapter.

NB: This report should be read in conjunction with the ESIA report and the specialists reports attached as Volume 2

2. SUMMARY OF PREDICTED IMPACTS

This section provides a detailed description of the impacts of the Project. The project will bring a number of impacts to the biophysical and socio-economic environment of the area. Some of these impacts are positive and some are negative. The following impacts were identified:

2.1 Construction Phase

C1 Land Management

- C1.1- Temporary loss of land and contractors' inadequate physical and social management of camps and workforce
- C1.2- Unsafe access routes and traffic
- C1.3- Permanent loss of land, Health and Safety hazards of operation and closure of borrow pits and quarries.
- C-1.4- Improper disposal and treatment of spoil sites
- C-1.5 - Improper disposal of solid and liquid waste
- C-1.6- Pollution Spills and inadequate clean-up
- C-1.7- Dust nuisance and hazard
- C1.8- Hazards to workers
- C1.9- Landscape change

C2 Water

- C2.1- Potential decreased water quality as a result of the construction phase activities
- C2.2- Sedimentation or rivers and streams pollution of rivers from oil spillage
- C2.3- Pollution from sanitation facilities
- C2.4- Further increased water turbidity/suspended solids and sedimentation, as a result of increased erosion

C3 Population and Economy

- C3.1- Increased population density
- C3.2- Transformation of population profile and behaviour patterns
- C3.3- Increased employment opportunity
- C3.4- Increased financial income
- C3.5- Increase in entrepreneurial opportunities
- C3.6- Change from subsistence economy to cash economy
- C3.7- Increased economic status for some

C4 Resettlement

- C4.1- Increased demand for land
- C4.2- Reorganization of current settlement patterns
- C4.3- Displacement of Community recreational facilities
- C4.4- Disruption of cultural setting
- C4.5- Impact on host communities
- C4.6- Loss of natural resource base

C5 Services

- C5.1- Increased demand for social services
- C5.2- Increased demand for recreational facilities
- C5.3- Increased public traffic load
- C5.4- Inhibited access to resources and services
- C5.5- Development of new pathways
- C5.6- Loss of assets and cultural property

C6 Flora and Fauna

- C6.1- Loss of threatened vegetation type
- C6.2- Loss of plant species of conservation concern
- C6.3- Increased harvesting of natural resources
- C6.4- Loss of habitat for fauna species of conservation concern
- C6.5- Disruption of ecological corridors

C7 Gender and Human Rights

- C7.1- Increased employment opportunities for women and disadvantaged groups
- C7.2- Increased financial income for women and disadvantaged groups

O8 Public Health

- C8.1- Increased Population density
- C8.2- Increase in Malaria prevalence
- C8.3- Increased in HIV/AIDS
- C8.4- Water-borne diseases
- C8.5- Work related accidents and ill-health e.g. traffic accidents and dust
- C8.6- Hazards from blasting
- C8.7- Hospital, clinics accessibility
- C8.8- Drugs and alcohol abuse, social cohesion and crime.

2.1.1 Operational Phase

O1 Land Management

- O1.1- Loss of right to land for descendants of households
- O1.2- Increased pressure on land used for subsistence purposes
- O1.3- Increased conflicts
- O1.4- Decreased grazing land
- O1.5- Loss of productivity in livestock farming
- O1.6- Decreased access to dip tanks
- O1.7- Loss of crop diversity

O2 Ecology

- O2.1- Loss of plant species of conservation concern
- O2.2- Increased invasion by alien plants
- O2.3- Increased harvesting of natural resources
- O2.4- Loss of habitat for species of conservation concern
- O2.5- Increased hunting of animal resources

O3 Population and Economy

- O3.1- Increased Population density
- O3.2- Transformation of population profile and behaviour patterns
- O3.3- Increased employment opportunity

- O3.4- Increased financial income
- O3.5- Increased in entrepreneurial opportunities
- O3.6- Change from subsistence economy to cash economy
- O3.7- Increased economic status for some

O4 Public Health

- O4.1- Increased Population density
- O4.2- Increase in Malaria prevalence
- O4.3- Schistosomiasis prevalence
- O4.4- Increased in HIV/AIDS
- O4.5- Water-borne diseases
- O4.6- Work related accidents and ill-health e.g. traffic accidents and dust
- O4.7- Increase in drowning
- O4.8- Exposure to toxins
- O4.9- Hospital, clinics accessibility or opposite
- O4.10- Housing Congestion
- O4.11- Drugs and alcohol abuse, social cohesion and crime.

O5 Climate Change

- O5.1- Increase of the crop water requirement
- O5.2- Water resource availability

O6 Air Quality

- O6.1- Emission of gases from burning of sugar cane
- O6.2- Emission of gases during transportation of sugar cane

O7 Livestock and Rangelands

- O7.1- Reduced quality and quantity of grazing area
- O7.2- Increased invasion of IAS
- O7.3- Reduced access to drinking water for livestock
- O7.4- Depreciation of Health of livestock
- O7.5- Increased Disputes

O8 Water

- O8.1- Chemical Pollution
- O8.2- Eutrophication
- O8.3- Pollution of groundwater
- O8.4- Potential decreased water quality in the Mhlatuzane River as a result of releases from the Lubovane Dam

O9 Community Facilities

- O9.1- Increased demand for social services
- O9.2- Increased demand for recreational facilities
- O9.3- Increased public traffic load
- O9.4- Inhibited access to resources and services
- O9.5- Improved Water Supply and Sanitation

O10 Community/ Social Organisation

- O10.1- Land Disputes
- O10.2- Disruption of community organizations and social groupings
- O10.3- Increase in social cohesion
- O10.4- Increased community grievances

O11 Soils

- O11.1- Increase in sodicity in concave colluvial soils
- O11.2- Decrease in soil organic content
- O11.3- Increase in groundwater salinity and nitrate content

O12- Gender and Human Rights

- O12.1- Economic empowerment for women
- O12.2 -Acquisition of new skills
- O12.3- Unequal access and participation
- O12.4- Reduced benefits to families
- O12.5- Marginalisation of women

O13 Waste Management

- O12.1- Improper Management of Solid waste from farm operations

O14 Transboundary Impacts

- O14.1- Inability to maintain minimum flows
- O14.2 -Water inavailability from upstream uses
- O14.3 -Water logging and soil salinity
- O14.4- Pollution of surface water and groundwater resources
- O14.5 -Contamination of drinking water supplies

3. TABLE OF MITIGATION MEASURES

3.1 Pre-Construction and Construction Impacts

3.1.1 Construction Process

Table 1: Construction Process Mitigation Measures

Impact	Description	Mitigation	Timeframe	Responsibility	Comments	Cost (E)
Temporary loss of land and Contractor's inadequate physical and social management of camps and workforce	The construction contractor will need land to establish camps including site offices, workshops, stores, vehicle parking, and staff accommodation. Other land will be needed temporarily for aggregate processing and concrete manufacture, metal fabrication, back-up power generation, and access.	Water supply & sanitation facilities in workers camp	Before commencement of construction.	Contractor	To be included in tender to be supplied by contractor. District health office to ensure regular control with facilities. Training of district staff also in anticipation of future implementation of water and sanitation programme. Mobile and fixed sanitation facilities. Employment of one additional health staff at district office (also in anticipation of future project)	0 150.000 240.000/ 3 years
		Provision of waste management facilities	Before commencement	Local Authority / chief/ Tink-	Chiefdoms allocate land for land fills, mainly	

Impact	Description	Mitigation	Timeframe	Responsibility	Comments	Cost (E)
		(receptacles, disposal site, etc)	ent of construction.	hundla/ contractor	construction material. Contractor responsible for transport of construction material to land fill. Local authority to provide staff to collect regularly waste along construction site (12 man/days/km)	16.000
					Bins/ containers	20.000
		Proper rehabilitation (decommissioning) of site after completion of construction phase	After completion of construction canal	Contractor	To be included in tender/ taken care of by contractor (4 sites)	600.000
Unsafe access routes and traffic	There will be a need to have access roads to contractor camp, site offices. The alignment of these access roads may present a risk to other motorists and pedestrians. In some cases, the construction traffic would need to use public roads, which may contribute to the damage of these roads. In addition, there are other issues like dust, noise and	Contractor's workers & public awareness campaign	Before commencement of construction.	SWADE/ chiefdoms	Billboards and posters , meetings at Tinkhundla level	50.000
		Putting up relevant road signs	Before commencement of construction.	Contractor	300 road signs	60.000

Impact	Description	Mitigation	Timeframe	Responsibility	Comments	Cost (E)
	safety issues that may arise.					
Health and Safety hazards of operation and closure of borrow pits and quarries	During construction, there will be a need to for burrowing of suitable materials for construction like sand and gravel for road construction, storm water management and rehabilitation of disturbed areas.	Putting barriers around borrow pits. Use of excavated materials as fill in same area.	Throughout construction phase	Chiefs / contractors	Chiefs allocate burrow site. Contractor to ensure proper measures against safety hazards to be included in tender (barriers, fencing, gate requirements)	0 6,000
		Proper rehabilitation of burrow pits and quarries	End of construction phase	SWADE/ consultant/ contractor	Drafting of a site plan and establishment of operational standards to be included in tender to instruct contractor on extraction process, depth of extraction, machines to be used, etc) Rehabilitation of 4 sites	35.000 200.000
		Stockpiles to separate topsoil for use during rehabilitation	During Construction phase	Contractor	Included in tender/contract	0
		Rehabilitation plans for all burrow sites to be put in place.	Within 2 years of project commencement	Contractor/ Min of Natural Resources	Monitoring visits and reporting on rehabilitation progress	5,000

Impact	Description	Mitigation	Timeframe	Responsibility	Comments	Cost (E)
Improper disposal and treatment of Spoil sites	The project will involve the excavation of soil (construction of canal and access roads), and rock surplus to requirements for fill or unsuitable for re-use in the Works. This will require disposal, taking up land and possibly creating a source of sediment.	Use of excavated materials as fill in same area.	During Construction phase	Local authority	Covered by site plan and operational standards issued (see above)	0
		Reuse of old borrow sites (for field road building)	During Construction phase	Local authority	Sites administered by local government to ensure that old burrow sites are well protected and available for reuse against license	0
		Identification of spoil sites taking into account environmentally sensitive sites (wetlands, rivers)	Before project commencement.	Contractor/ Natural Resources Authority	Available from contractors compliance reports and above monitoring visits	0
Improper disposal of solid and liquid waste Pollution Spills and inadequate clean-up	Camp sites and offices will generate general waste as well as special waste from minor servicing of vehicles, first aid or site mini clinic. If these wastes are not properly managed, they may lead to land pollution as well as being a nuisance to the environment. Spills of oils and other liquid waste would lead to pollution of	Site Waste management plan to be put in place to be put in place and communicated to all workers. This plan should be included in the overall construction plan.	Before project commencement.	Contractor/ SWADE/District office	SWADE and District office to follow up and monitor implementation. To be included in contractors compliance report	0
		Spill containment structures to be put in place, general spill clean up guidelines to be prepared and communicated to workers.	Before project commencement.	Contractor/ SWADE/ District Office	District office to be trained in waste management standards and on how to deal with pollution spills and inadequate clean-up. Training to qualify district staff to control spill and	

Impact	Description	Mitigation	Timeframe	Responsibility	Comments	Cost (E)
	land and water resources. The project will also involve the use of stationary and mobile plant and equipment requiring refuelling, mainly with diesel, and the construction of permanent and temporary fuel storage. Accidents and spills usually occur, the two most likely being contamination of soil by used engine oils and the spillage of diesel from mobile bowzers.				clean –up measures. (3 staff)	10.000
		Regular servicing of vehicles and machinery to avoid oil leaks. There should be no trucks servicing onsite. Local garages should be used to service these vehicles and machinery offsite.	During construction phase	Contractor	To be included as part of the operational requirements when implement the project	60.000
Soil Erosion	Removal of vegetation cover exposes the soil, making it prone to erosion. Some parts of the project area are prone to erosion. Clearing activities will be carried out during setting up of camp site, site offices, access roads, canal route, working sites like cement mixing areas, material storage area.	A storm water management plan needs to be put in place in the working areas. These should include working methods that minimize erosion, putting up runoff management structures, and awareness raising activities.	Before project commencement	Contractor		

Impact	Description	Mitigation	Timeframe	Responsibility	Comments	Cost (E)
Pollution from daily routine of construction work		Onsite treatment where turbidity and organic matter (like settling ponds) are physically and biologically removed before discharge of the effluent to the environment.	During construction phase	Contractor	To be included as part of the operational requirements when implementing the project Transportation costs	0 15.000
Dust nuisance and hazard	Canal and dam construction, transportation and land clearing activities will generate a considerable amount of dust, which is a health hazard, a nuisance and cause reduced visibility, which may also lead to accidents.	Dust suppression to be done in all dusty areas of the sites	During construction phase	Contractor	Measures to be requested and included in contract Plastic sheeting, etc	0 30.000
Hazards to workers	Experience of LUSIP I indicate that there will be accidents and injuries during construction of the canal and the dam. If not mitigated the project can impact negatively to the workers and the community. Traffic is going to increase due to the	Contractor's workers awareness campaign training programme provision of PPE, Signs to be put up to warn on safety hazards	During construction phase	Contractor	Initiate information and awareness campaign to local workers. Design and production of signs. Regular follow-up by authority at site levels.	40.000

Impact	Description	Mitigation	Timeframe	Responsibility	Comments	Cost (E)
	construction activities and accidents and excessive dust are likely to occur in the project area as a result. If not mitigated this can be a serious problem					
Landscape change	Construction sites for workers camp, site offices and other construction works will change the natural landscape of the area.	Screens to be put in place, where applicable to reduce appearance of scaring.	During construction phase	Contractor		50.000
Flooding	Project activities and structures next to rivers may be exposed to flooding risks, especially during the rainy season. This would further be exacerbated by the presence of vertisols within the project area.	Construction of site offices, material storage sites, workers camps will not be done within 50 metres distance from rivers and streams.	During construction phase	Contractor		0

3.1.2 Water and Aquatic life

Table 2: Water and Aquatic Life Mitigation Measures

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
Potential decreased water quality as a result of the construction phase activities	Pollutants such as petrol/fuels runoff from roads and other areas within the construction areas (canal route, roads, dam). Deterioration in water quality as a result of the development may affect especially those fish species sensitive to changes in water quality, namely <i>O. peringueyi</i> and <i>C. emarginatus</i> . Changes in water quality may also affect the primary producers (algae and other aquatic vegetation), which are important food and cover for fish.	All refuelling sites need to have containment structures to ensure that spills are effectively contained and treated. Environmentally friendly treatment methods to be used for treatment of major spills.	During construction phase	Contractor		40,000
		Refuelling site/minor service sites will be located at least 100 meters away from rivers and streams	Before project commencement	Contractor		0
		All personnel assigned to work in fueling sites need to be trained on spill emergency response.	During construction phase	Contractor	Role of river basin authority and/or water company/ association/authority to be formed. Concerns also district authority Monitoring and reporting procedures to be strengthened and to be implemented. Improved lab	0 300,000

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
					facilities and transport	
Sedimentation or rivers and streams	Construction activities may cause soil material to get into rivers and streams and cause choking of aquatic life.	Construction activities should be done at least 30 meters away from rivers and streams as per legislation. Runoff need to be minimised by using just the required amount of water for an activity.	During construction phase	Contractor	See above	0
		All working areas need to have runoff control systems including silt traps and storm water drainage systems.	During construction phase	Contractor		100,000
Pollution from sanitation facilities	Sanitation facilities in the workers camp may cause pollution from sewer if the facilities are located next to water bodies. In cases where the soil is porous, sewer may seep, polluting groundwater resources.	Sanitation facilities need to be located away from surface water bodies (streams, rivers, dams). The designs of these needs to take into account the permeability of the soils as well as the water table level.	Before project commencement	Contractor		0
		A maintenance plan for sanitation facilities will be put in place to avoid leakage of sewer to water bodies.	During construction phase	Contractor		5,000

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
Further increased water turbidity/suspended solids and sedimentation, as a result of increased erosion	Construction activities may cause soil material to get into rivers and streams and cause choking of aquatic life. It can therefore be deduced that the very high levels of suspended solids observed at times in the study area may be responsible for degradation of the ecological integrity of the aquatic ecosystems. This already has high impact on the ecosystem and may be further aggravated by LUSIP II.	Wastewater from washing activities needs to be contained for solids to settle before discharge to the environment. This may be through settling ponds or silt traps.	During construction phase	Contractor	Contractor	50,000

3.1.3 Population and the Economy

Table 3: Population and the Economy Mitigation Measures

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost
Increased population density	People may move into the area to take advantage of opportunities. The increased pressure and demand on land may lead to the development and growth of informal	Develop an influx management plan to cater for immigrants and job seekers.	Before project commencement	Traditional Authority/SWA DE		
		Construct a camp site for workers sited separate from community	Before project commencement	Contractor	Covered under Construction	0

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost
	settlements.	settlement areas.			process impacts.	
Transformation of population profile and behaviour patterns	The influx of people in the area, as well mainly males for construction work may lead to increased promiscuity, higher potential for unwanted pregnancies and commercial sex workers.	Local authorities need to be empowered to maintain order within the community. Both temporary and permanent newcomers to the area must be made known to the authorities.	Throughout construction phase	SWADE	Costs covered under public health impact mitigation	0
		There is need to have community education and training to manage community reaction to new people in the area.	Throughout construction phase	SWADE/Regional Health Office	Costs covered under public health impact mitigation	0
		Peer education programmes to be put in place for construction workers to avoid unbecoming behaviour.	Throughout construction phase	SWADE/Local Authority	Costs covered under public health impact mitigation	0
Increased employment opportunity	The project will increase the employment opportunities. This will help reduce urban migration, leading to more stable families. The workers will, also benefit for the transfer of skills as they work in the project, which will increase their opportunity for future employment.	This is a benefit to the community which should be enhanced by giving locals first preference in jobs where the skill set is available in the community.	Before project commencement	Contractor	n/a	0

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost
Increased financial income	Employment of local population will result in improved income levels for households. This will lead to improved livelihoods, whose effect will impact disadvantaged groups like women and children.	This is a benefit to the community which should be enhanced by giving locals first preference in jobs where the skill set is available in the community. In addition, there is a need for education of employees on financial management to enhance benefit of family members.	Before project commencement	Contractor		0
Increase in entrepreneurial opportunities	Local SMMEs will benefit from the increase in demand for goods and services that will be required both in the construction activities and as a result of increased population in that area.	This is a benefit nationally. Local entrepreneurs with the capacity for supply of relevant goods and services to be encouraged to tender. In cases where partnerships can be made between non local bigger subcontractors and smaller local contractors, these should be encouraged.	During Construction phase.	SWADE		0
Change from subsistence economy to cash economy	The change of the source of livelihood to irrigated agriculture would imply that there would be requirement for more finances to sustain subsistence needs than before the project. Those families that would not be part of the	This impact cannot be mitigated if the project is implemented.	n/a	n/a		0

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost
	schemes may feel vulnerable.					
Increased economic status for some	The project will lead to an increased income for some of the community members. The new economic status for some in the population may lead to other members of the community taken advantage of and more vulnerable.	Community leadership to be sensitised on the possibility of this impact	During Construction	SWADE		20,000

3.1.4 Resettlement

Table 4: Resettlement Impacts Mitigation Measures

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E1,000)
Acquisition of land in Swazi Nation Land	There will be homesteads, graves and other structures that would need relocation in the project. Additional land needs to be acquired to cater for the resettled homes and structures, which is a bit of a challenge in Swazi nation land.	Traditional authority should be engaged to facilitate the identification of host areas. The people in the potential host areas should be engaged to encourage their cooperation as the land for resettlement is identified.	Before project commencement.	SWADE		0
Reorganization of current settlement patterns.	A total of 22 homesteads will be affected by the construction of the project's main canal (excluding homesteads within the irrigation blocks). Of these households, 19 will definitely be displaced and require resettlement since they fall within 100 meters of the preliminary canal alignment. The support networks between neighbours and with community based organizations may be severed	Families should be resettled taking into account their current proximity to schools, CBOs and other local infrastructure. Resettlement options should avoid breaking up communities, because the maintenance of the social networks linking members of the affected communities may be critical to the successful adaptation of those communities to their new circumstances. Though community preservation is a primary concern, some members of the community may have other settlement	Before project commencement.	Community leaders/SWAD E	Resettlement of household structures and VIP toilets	10,106.4 + 165

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E1,000)
	when resettlement occurs	preferences, including a preference <i>not</i> to remain part of the affected community. For this reason, all community members will be consulted and provided with appropriate options for resettlement. Experience from LUSIP I shows though that homesteads may prefer to relocate not far away from the canal so to benefit from the development of the project.				
Displacement of Community recreational and social facilities	One (1) dip tank is affected by the canal and one (1) soccer field will also have to be relocated. There is only one shop that could be impacted by the resettlement of the affected homesteads. This though may be as a result of whether the homesteads are resettled far away from their current locations.	Host areas identified to ensure resettled people have access to facilities like shop, dip tanks and recreational facilities.	Before project commencement.	Community leadership/SW ADE	1 Dip tank and 1 Soccer field	158.4 21.1

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E1,000)
Loss of assets and cultural property	A total of 8 ha of arable fields are affected to varying degrees by the canal and reservoir at the end of the canal. There are 54 graves that will be affected. The removal of these to make way for the development will lead to a sense of loss of assets and culturally important property (graves). In addition the exhuming of graves may also lead to the affected families reliving the grief that that had dealt with over a period of time.	The community should participate in any decision making process which affects their development and/or the distribution/ reallocation of their lands. The implementation of the resettlement plan should be done in addresses the relocation of these.	Before project commencement.	Community leadership/SW ADE	54 Graves +Fields +Other Assets (i.e. kraals, Fruit trees, etc)	491.1 +
						546.8
		A community participation process was initiated in 2000 to establish a representative community consultation and participation structure through which the people of the Lower Usuthu could participate in the planning, design, and implementation of the project. Consultation and participation in resettlement and compensation planning has thus far occurred at homestead, sigodzi and uMphakatsi level. Individual and group/community consultation will continue during project implementation to clarify resettlement choices and compensation principles and rates, and to ensure that affected				0

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E1,000)
		homesteads fully understand their entitlement packages.				
Impact on host communities	The introduction of new homesteads in the host areas will lead to a need for reallocation of resources and disruption of the social setting.	Constant engagement of resettled and host community to be done. Community structures to enhance smooth transition and adaptation of affected people.	Through project commencement	SWADE		10,000

3.1.5 Services

Table 5: Services Impacts Mitigation Measures

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost
Increased demand for social services	The introduction of new people in the area will lead to an increased demand/pressure for education (increased teacher: pupil ratios), increased demand for police services (increased crime rates).	The Police Department and all relevant ministries (education, health) to be engaged in ensuring that the services are able to meet the increasing the demand. There may be a need to have the capacity of the existing schools increased to meet demand.	Before project commencement	SWADE/Police/Ministry of Education/Ministry of Health	Increasing capacity of schools (classrooms and teachers) and personnel in the police force. This exercise and costs are to be borne by government as and when the	3,000,000

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost
					need arises.	
Increased demand for recreational facilities	The project is likely to lead to an increase in the demand for recreational facilities due to increase in local population.	Recreational facilities relevant to the community setting to be put in place, in consultation with the community.	During construction phase	Traditional leadership, SWADE	Costs covered under Public health Impacts.	0
Increased public traffic load	There will be an increase in the demand for transport for buses and other public transport as a result of the increase of population in the area.	None				n/a

3.1.6 Flora and Fauna

Table 6: Flora and Fauna Impacts Mitigation Measures

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
Increased harvesting of natural resources	The potential increase of people into the study area through the development of the irrigation project could result in elevated levels of harvesting of natural resources such as fuelwood and traditional	The local community should be allowed to harvest the areas of natural vegetation that are to be cleared prior to clearing;	During construction phase	Contractor	Agreement by chief/ local authority	0
		Areas of natural vegetation that are to be excluded from the development should be clearly	During construction	SWADE/Contractor	Some signs and some fencing	50,000

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Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
	medicine. Removal of woody species for fuelwood has a particularly dramatic impact on vegetation structure and canopy cover and results in significant habitat alteration.	demarcated and excluded from the agreement allowing the local community to harvest vegetation.	phase			
Disruption of ecological corridors	While much of the study area has already been transformed through agriculture, the remaining areas of natural habitat are important refuges and ecological corridors along which fauna can move through transformed habitat. Destruction of these corridors and refuges will render much of the study area uninhabitable for many of the fauna species currently present in the study area.	All belts of riparian woodland and forest along the Usuthu River should be excluded from the development and a buffer of 100 metres on either side of the river be maintained;	During construction phase	SWADE/Design consultant	Land use plan, administrative order, policy to be disseminated to contractor and the local population (pamphlets)	20,000
		All riparian zones of smaller tributaries of the Usuthu River, whether perennial or non-perennial, should be excluded from development and a 30 metre-wide buffer should be implemented; these will then act as ecological corridors through which fauna can move across transformed habitat;	During construction phase	SWADE/Design consultant	Land use plan, administrative order, policy to be disseminated to contractor and the local population (pamphlets, etc. incl. above)	0
		The large tract of <i>Combretum apiculatum</i> – <i>Aloe marlothii</i> Woodland along the eastern border of the study area should be left undisturbed as a buffer with the	During construction phase	SWADE/Design consultant	Land use plan, policy to be disseminated to contractor and the	0

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
		foothills of the Lebombos to the east; this is key habitat for African Hawk-Eagle, the most threatened species confirmed during fieldwork.			local population (pamphlets, etc) Costs included above	
Loss of threatened vegetation type	Areas of untransformed vegetation in the study area vary from moderately to poorly representative of Zululand Lowveld, a threatened vegetation type that has been classified as Vulnerable. Destruction of untransformed vegetation will have a significant local impact on biodiversity, and increase the cumulative impact of fragmentation of this vegetation type.	All belts of riparian woodland and forest along the Usuthu River should be excluded from the development and a buffer of 100 metres on either side of the river be maintained;	During construction phase	SWADE/Design consultant	Land use plan, administrative order, policy to be disseminated to contractor and the local population (pamphlets, etc. incl. above)	0
		All riparian zones of smaller tributaries of the Usuthu River, whether perennial or non-perennial, should be excluded from development and a 20 metre-wide buffer should be implemented;	During construction phase	SWADE/Design consultant	Land use plan, administrative order, policy to be disseminated to contractor and the local population (pamphlets, etc. incl. above)	0
		The large tract of <i>Combretum apiculatum</i> – <i>Aloe marlothii</i> Woodland along the eastern border of the study area should be left undisturbed as a buffer with the	Before project commencement	SWADE/Design consultant	Land use plan, administrative order, policy to be disseminated to contractor and the	0

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
	<p>xanthophloea, Huernia hystrix, Orbea paradoxa, Spirostachys africana and Stapelia gigantea) and four Schedule C species (Aloe marlothii, Aloe parvibracteata, Boscia albitrunca and Sideroxylon inerme) were confirmed to occur in the above three communities and are most likely to be impacted and experience population declines.</p>					

3.1.7 Public Health

Table 7: Public Health Mitigation Measures

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
Increased Housing Density	Population density currently at average stands at 66 habitants per km ² in the project area. There is likelihood that there will be an increase in population density due to influx of job seekers. Influx of people impact on diseases and family stability by bringing in new strain of pathogens or increase on pathogens dose per person or increase the rate of transmission.	Develop an influx management plan to cater for immigrants and job seekers.	Before project commencement	Traditional Authority/ SWADE	Covered under Population and Economy	0
		Create a camp site for workers sited separate from community settlement areas.	Before project commencement	Contractor	Covered under construction phase	0
		Put in place stiff regulations that prohibit community access inside the camp and prohibit workers from sleeping within the community residents.	During construction phase	Contractor	Covered under construction phase	0
		Work through Chiefs to control operations of shebeens in the project area.		Contractor		
Malaria prevalence	Malaria is prevalent and endemic but under control. Thanks to the effort of the Malaria Unit that has been able to put malaria under	Strengthen the malaria control activities by providing funding to maintain the malaria surveillance system and interventions in the	Throughout project life cycle	SWADE/Ministry of Health (NMCP)	Vehicle for public health staff+ operation	175.000 + 30.000 30.000

Impact	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
	control in the past decade. There is strong likelihood that the malaria gains of the past few years maybe compromised by the project due to small pools of stagnant waters in ditches created due to environmental modification and littering during construction and irrigation. The project is likely to increase in Malaria prevalence in the project area.	project area.			Training and workshops (transport mainly) Distribution of mosquito nets (10.000 nets)	400.000
		There is need to establish community based health education committees that facilitated the malaria control programme. The importance of these committees cannot be over emphasized especially now that there will be an increase in water bodies. These can be facilitated and coordinated through clinics or public health inspectorate offices in the locality.	Throughout project life cycle	SWADE/Ministry of Health (NMCP)	At least one community based health education committee in each chiefdom. Training, workshops, education material, printing of material and posters	50.000

		Vector control activities should also occur at the construction site to prevent vector proliferation. This should include larval control, net use and indoor residual spray.	Throughout project life cycle	SWADE/Ministry of Health (NMCP)	Bed nets (1.000), insecticide spraying, monitoring vector resistance	40,000 20,000 20,000
Increase in HIV/AIDS	HIV/AIDS is prevalent and endemic in the project area. The disease is likely to impact negatively to public health due to the manner in which it is transmitted. Influx of people will exacerbate the prevalence of the disease normally workers are males who don't bring along with them their wife because the conditions at such work environment don't allow them to bring their spouses due to lack of accommodation. Hence they turned to take local women as companion for the time being at work place. This behaviour increase the prevalence of diseases like HIV/AIDS, TB,	Develop a HIV/AIDS management programme that will target both the workplace and community factors that predispose workers and community to acquiring the disease.	Throughout project life cycle	SWADE/Ministry of Health/Contractor	Employ consultant and health service staff to develop programme and action plan, support networking between available local resources and technical expertise, company policy, code of practice, awareness and	200,000

	syphilis, gonorrhoea and genital warts				prevention programs, counselling facilities, access to testing and treatment	
		Support equal employment opportunities and develop a strategy that will encourage women to take up jobs that are known to be exclusively for men.	Throughout project life cycle	Contractor	Meeting with senior staff, advocacy to influence company policy	0
		Promote create alternative opportunities for women to reduce the potential for commercial sex work within the project area.	Construction phase	SWADE	Agricultural training courses on mixed crop production and sheep/goat production. Contract consultant/train extension staff (3 years)	200.000
		Reinforce HIV/AIDS programme that facilitate peer education in	Through all	Community leadership/Ministry/	Education material,	

		both the workforce and community. These should have a gender focus in both men and women with the intention to empower women to refuse to be abused sexually. The focus should be driven toward behaviour change for casual and high risk sexual behaviour change.	project stages	SWADE	radio programmes and frequent meetings on public health education, involve leaders, publish code of conduct (pamphlets), etc	300.000
		Prevent association of external contractors with the community through codes of conduct.	Construction phase	Contractor	Instructions to contractor, establishing of code of conduct and its dissemination. Provide recreation facilities for external contractor staff	0 20,000
		Put in place stiff or rigid regulations that prohibit community access inside the camp and prohibit	Construction phase	Contractor/Traditional leadership	Implement code of conduct and	0

		workers who reside on camp from sleeping within the community residents to prevent casual sexual relationships.			practice	
Water borne diseases	Water borne diseases are prevalent in the project area. Mostly are experienced during rainy seasons and contribute significant number of patients in the clinics that are in the area. Diseases like cholera; typhoid; diarrheal and dysentery are the most prevalent diseases in the project area.	Develop a strategy in conjunction with the chiefs to manage the water schemes and sanitation programmes.	Construction period	Traditional Authority/ SWADE	Employ consultant/ health officer and develop/ agree on strategy. (fees, transport). Coordinate with SWADE for establishment of water association units)	20.000
		Develop a system for sanitary excreta disposal system that can operate effectively in water logged places. This is because the soils of the project area are said to have high water table and ordinary VIP latrines are not suitable now that irrigation will contribute significantly to rise in water table.	Construction phase	SWADE	Inform project management implementing the water and sanitation project. Otherwise the system should have	0

					been established in specific feasibility study.	
		Design a method of medical waste disposal suitable for home base care activities. The system should consider the pattern and distribution of home base care patients in the project area.	Construction phase	SWADE/Ministry of Health	Employ consultant to advise and monitor implementation (3 years)	75.000
		Enforce health education on sanitation and solid waste management within the community.	Construction phase		Included activity in chiefdom development plans. Regular education activities in schools and with families when supplying water and sanitation to households. Could be a condition prior to	200.000

					<p>delivery.</p> <p>Travelling, per diem, fees.</p> <p>Education and production of pamphlets</p>	
		<p>Ensure adequate onsite solid waste management to prevent environmental pollution.</p>	<p>Construction</p>	<p>Contractor</p>	<p>Establish code of conduct. Contractor to be responsible for transportation of solid waste, while district office/chief allocates land for land fill for disposal of solid waste</p> <p>Employ expert and staff from environment</p>	<p>100.000</p>

					sector	
Sanitation facilities	Loss of bush will increase the reliance on improved sanitation facilities which the project is bound to provide according to government regulations. It must be noted that materials must be provided on time as communities have been disappointed in the past in this regard.	The national standard for portable water should be adhered to throughout the PDA	n/a	n/a	n/a	n/a
Work related accidents and ill-health e.g. Traffic accidents and dust	Experience of LUSIP I indicate that there will be accidents and injuries during construction of the canal and the dam and operation of the irrigation scheme. If not mitigated the project can impact negatively to the workers and the community. Traffic is going to increase due to the construction activities and accidents and excessive dust are likely to occur in the project area as a result. If not mitigated this can be a serious problem	Develop emergency response plans for both community and work place related accidents management.	Before construction commences	Contractor	See above In addition appoint security staff to monitor safety and security in and around work place (hire expert on time basis to establish rules, monitoring and regular awareness meetings (3	0 300,000

					years)	
		Initiate and facilitate community education programs on road safety and risks of construction vehicles.	Construction	Contractor/SWADE	See above Print pamphlets and visit schools and public places	50,000
		Make sure there is occupational health and safety management plan at work place.	Construction	Contractor	See above	0
		Provide dust suppression measures and have a daily monitoring of dust caused by construction vehicles.	Construction	Contractor	As water not available, mainly stock pile dust suppression methods (material for treatment of surface)	400.000

		<p>Establish an appropriate emergency response and emergency medical stabilization facilities at the project site. The project will require a small stand-alone medical service to cater for emergency and limited occupational health care for the workforce at a minimum. This is because the local health care facilities are not equipped to support these activities.</p>	Construction	Contractor	<p>Employ medical staff during project period, Communication facilities, Medical facilities and beds</p> <p>Vehicle to allow fast transportation and emergency assistance (car+ running costs/ 3 years)</p>	<p>600,000</p> <p>35,000</p> <p>200,000</p> <p>250,000</p>
		<p>Develop training programs on First Aid based on local requirements and international best practice.</p>	Construction	Contractor	<p>First aid training programme implementation and medical kits</p>	50,000
		<p>Standardized first aid kits must be available in all vehicles, work areas and offices. The medical staff on</p>	Construction	Contractor	<p>Instruction on use (otherwise</p>	0

		site must check and replenish the kits. The kits must be sealed so when they are opened it triggers a notification of an incident and prevents pilferage (stealing in small quantities).			see above)	
Hazards from blasting	Three (3) homesteads located outside the periphery of the canal may be affected by blasting. Hazards from blasting will include dust, flyrock and a compromised integrity of property in homesteads.	Affected homes need to be informed in advance of any blasting activity (at least 3 days).	Construction	SWADE/Contractor		0
		Crack survey and Photographic evidence of the state of the structures within 500m before blast to be kept to allow for effective monitoring of the effect of blasting activities.	Before start of construction	SWADE/Contractor		10,000
		<p>Compensation for affected structures to be done in cases where the blasting activities have affected these, using the following guidelines:</p> <ul style="list-style-type: none"> - Cracks to walls/windows damaged roofs to be replaced - Compensation to a maximum of 60% of the value of the structure 	Construction	SWADE/Contractor		RAP

<p>Hospital, clinics accessibility</p>	<p>There are three clinics in the project area. Bholi clinic which is mostly servicing community at Ngcamphalala, Lubulini clinic servicing mostly Mngometulu community and Ndzevane clinic servicing mostly Matsenjwa community. These clinics considering proximity to the community seem to be adequate, however the community complain that none of the clinics is able to admit patients yet with the burden of HIV/AIDS there is a need that patients sometimes are admitted.</p>	<p>One of the clinics in the project area needs to be upgraded to a health centre considering the magnitude of work to be done and the influx of job seekers.</p>	<p>Construction</p>	<p>SWADE/Ministry of Health</p>	<p>Upgrade (staff training, partial refurbishing and maintenance of facility, equipment) See also above</p>	<p>500,000</p>
<p>Housing congestion</p>	<p>Housing settlement is according to the Swaziland Policy of settlement where there is clearly defined area for agriculture, residential, and livestock. Residential is along the hillsides or settled along the roads. Currently at average there is 6 people per households. There is likelihood the population will increase considering the</p>	<p>Develop an influx management plan to cater for immigrants and job seekers.</p>	<p>Before commencement of construction</p>	<p>Traditional leadership/SWADE</p>	<p>Plan established with chief, staff from Min of housing and Min of Agriculture and environment (transport, workshops)</p>	<p>15.000</p>

	activity that will take place. This will impact negatively to public health because some immigrants would want to be accommodated within the community and that communities are likely to lure them to make money on rents. This will cause congestion and diseases like TB might rise. State of household hygiene might be compromised due to difference in habit of new comes.	Construct a camp site for workers sited separate from community settlement areas.	Before commencement of construction	Contractor	Local staff will partly return to their home Size of campsite needed for 50 workers (5 prefabricated homes of 30 sqm each at 400/sqm) + basic equipment	60.000 20.000
		Put in place stiff regulations that prohibit community access inside the camp and prohibit workers from sleeping within the community residents.	Construction	Community leadership	Instruction/ policy widely disseminated / camp supervisor	0
Drugs and alcohol abuse, social cohesion and crime.	There is likelihood that community members will see an opportunity to conduct business of selling alcohol to the workers. This can go as far as opening of shebeens business in their residents where the workers would	Develop a health education program that will target the communities and workers on domestic violence and substance abuse.	Before commencement of construction.	Contractor	Project management task and company supervision	0
		Work with Chiefs to control shebeens operation in the area.			Instruction/ policy widely disseminated	0

	congregate to drink. This may cause social instability, drugs and alcohol abuse, domestic violence, disturbance in social cohesion and crime.				/ camp supervisor to report to project management and local authorities	
	Support community leadership at the local level to reduce the potential for increased domestic violence.	Before commencement of construction.	Traditional leadership/ SWADE	Local authority training in community development / social services, law and policy (10 training of trainers/ awareness activities)	40,000	
	Strengthen country's policing and laws to manage cases of domestic violence, public drunkenness and substance abuse by reinforcing the training of community police.	-	Ministry of Justice	Local authority training on roles and responsibilities (law and policing, but also other topics valid for employed staff and	350,000	

					elected leaders) Manual preparation including various topics (social services, policing, housing, public health, etc)	
		Develop a specific workplace substance abuse policy and programme that incorporate health education at the workforce on substance abuse and domestic violence	Before project commencement	Contractor/SWADE	Company policy disseminated at regular meetings	0

3.2 Operational Phase

3.2.1 Land Management

Table 8: Land Management Mitigation Measures

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Loss of right to land for descendants of households	Swazi Nation Land (SNL) is held in trust by the King for the Swazi Nation and is governed, managed and allocated by Chiefs on behalf of the King. The local Chief may give families the right to grow crops on a certain area or to graze cattle on communal lands through a process known as <i>Kukhonta</i> . <i>Kukhonta</i> is a process by which an individual seeks residence and/or land in	The community should participate in any decision making process which affects their development and/or the distribution/ reallocation of their lands.		Community leadership	There are consultations that are currently carried out by SWADE, and they need to be continued, no additional costs anticipated.	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	<p>a chiefdom by approaching the local traditional authorities. Such allocations often includes the rights of inheritance by ones descendants. Land is usually allocated to the head of each household within a chiefdom in order for agricultural activities to be pursued. The size of the land allocated varies according to availability, the household's needs and resources, social status and lineage. This project, in a bid to make collateral for loans in banks, will result in the conversion of the land to be leasehold land, as opposed to the traditional system where descendants would have claim to the land. There is a concern among the community that the model used in LUSIP I will result in the land rights being eroded as the shares in the proposed farms are vested in only one family member at a time. In this sense only one family member will</p>	<p>The criteria for membership of associations need to be reviewed to ensure that it is as inclusive as possible taking into account the family size.</p>	<p>Before start of operational phase</p>	<p>Farmers Associations</p>		

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	ultimately 'inherit' the land which was previously used for the benefit of all the family.					
Increased pressure on land used for subsistence purposes	Land on SNL has no exchange rights except through inheritance and family relations, however because farming inputs are becoming expensive for rural farmers, people settled on SNL may seek to sell the rights to a portion of the land allocated to them, which will accelerate change in land use on SNL. The availability of additional irrigated land under LUSIP is expected to increase pressure on land previously used for cultivation of food and subsistence crops, grazing and other purposes.	Land should be made available alongside sugar cane so that other crops can be cultivated taking advantage of the irrigation system. Farmers need to be assisted in identifying local, national and international markets for such produce.	Before start of operational phase	Community leadership,		0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Increased conflicts	Access to new irrigation water under LUSIP will increase conflicts and pressure on SNL, especially land that is presently allocated and used for grazing cattle and growing maize and other food crops. Conflicts will also arise when larger sugar cane farmers attempt to further increase the size of their landholdings at the expense of small farmers, who would to an increasing extent become workers for larger farmers or concessionaires.	A grievance procedure should be drawn up and a strict timeframe for attending to issues outlined	Before start of operational phase	Community leadership,		5,000
Decreased grazing land	Land use on SNL can be expected to change dramatically as small subsistence fields and dryland maize or cotton fields surrounded by communal grazing lands are converted to irrigated fields, leaving smaller areas for cultivating maize or vegetables. Winter grazing lands for cattle on rich alluvial soils along the riverbanks will diminish, as will large amounts of summer grazing lands	Grazing areas between blocks need to be identified and properly fenced. Alternative cost effective animal feeds to be identified.		Community leadership SWADE	Comprehensive costing to be done under Livestock and range management	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	around the fields.					
Loss of productivity in livestock farming	The Ministry of Agriculture farm that will be used in the project is currently used as a breeding station to assist farmers in livestock farming. Conversion of this land for arable agriculture will lead to a reduction of productivity for livestock farming, which will affect not only the project area, but livestock farming in the country.	Livestock farmers should be encouraged to raise cattle for commercial purposes (e.g feed lots)	Before commencement of construction phase.	SWADE		30,000
Loss of crop diversity	It is perceived that there is currently better food security as the staple food, maize, is being planted. As sugarcane is not a food crop, the families will have to rely on commercially bought maize. In some instances the budgeting abilities of the families is not yet developed sufficiently to rely on cash only for all their needs.	Land should be made available alongside sugar cane so that other crops can be cultivated taking advantage of the irrigation system. Farmers need to be assisted in identifying local, national and international markets for such produce.	Start of the operational phase	Community leadership, Farmers associations		0
	Existing famers associations warn that at the inception phase of the irrigated farm	Expectations of the benefits of sugarcane farming must be managed by ensuring that	Before commencement of commercial	SWADE		0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	blocks, the dividends achieved are not sufficient for family food requirements.	associations have a clear indication of expenses such as transport and electricity as well as profits to be derived. Such figures can be drawn from existing projects.	farming activities.			

3.2.2 Impacts on Flora and Fauna

Table 9: Flora and Fauna Operational Phase Mitigation Measures

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
Loss of plant species of conservation concern	While transformed areas are unlikely to have populations of plant species of conservation concern, it is likely that areas of natural habitat do support such populations. The vegetation communities supporting the most plant species of conservation concern are Acacia nilotica – Grewia flavescens Low Closed Woodland, Acacia swazica – Sclerocarya birrea Low Open Woodland and Acacia luederitzii – Euclea divinorum	Populations of threatened and protected species should be removed under the supervision of a qualified and experienced botanist and relocated to adjacent representative habitat that has been selected by the botanist; where this happens to be outside of the study area, then negotiations should be made with relevant landowners for the relocation of these plants onto their land.	Before commencement of construction phase.	SWADE/Community leadership	See above	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
	Low Closed Woodland, all of which are likely to experience some clearing during the project. Populations of one Schedule A protected species (<i>Bolusanthus speciosus</i>), five Schedule B species (<i>Acacia xanthophloea</i> , <i>Huernia hystrix</i> , <i>Orbea paradoxa</i> , <i>Spirostachys africana</i> and <i>Stapelia gigantea</i>) and four Schedule C species (<i>Aloe marlothii</i> , <i>Aloe parvibracteata</i> , <i>Boscia albitrunca</i> and <i>Sideroxylon inerme</i>) were confirmed to occur in the above three communities and are most likely to be impacted and experience population declines.					
Increased invasion by alien plants	Areas that are to be cleared for cultivation will provide a base from which invasive alien species could establish and invade adjacent natural habitat. A seed-base for these species already exists and includes species that are currently a severe threat to	A team of labourers should be trained in the application of mechanical and chemical plant control measures, and in the safe use of the herbicides involved;	Beginning of operational phase.	Farmers Associations	Establishment of practical training programme, Hiring of expert, practice and dissemination	10,000

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
	biodiversity in Swaziland, such as <i>Parthenium hysterophorus</i> , <i>Chromolaena odorata</i> and <i>Lantana camara</i> .				n of information and follow-up meetings. Inform about management plan	
		All belts of riparian vegetation along the Usuthu River and its tributaries should be targeted for the clearing of invasive alien species, particularly <i>Chromolaena odorata</i> and <i>Lantana camara</i> ;	After completion of construction phase.	SWADE/Community leaders	Trained teams (10) inspect and clear targeted areas of IAS over 3 years. Involves training of teams, field work (local staff staying at home base). Expert as coordinator (gov+expert to train gov.	30,000 600,000 350,000

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
					staff)	
		Once these areas have undergone the initial phase of control, other areas of natural vegetation, particularly near riparian zones and on the plains, should be targeted for control measures;	After completion of construction phase.	Community leaders.	Implement management plan to combat biodiversity threats. To be included in district and chiefdom development plans. Expert to contact and train local authority staff and involve central administration. Mainly transport and meetings costs.	15,000

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
		An alien plant audit should be conducted every 2-3 years in order to evaluate the progress of the management plan, and the plan should be adjusted according to the results of the audit.	Started two years after commencement of operational phase.	SWADE, Farmers Associations.	Audit to be done at beginning and at end of project period (2 x 6-man/weeks, gov + consulting expert).	100,000
Increased harvesting of natural resources	The potential increase of people into the study area through the development of the irrigation project could result in elevated levels of harvesting of natural resources such as fuelwood and traditional medicine. Removal of woody species for fuelwood has a particularly dramatic impact on vegetation structure and canopy cover and results in significant habitat alteration.	The local community should be allowed to harvest the areas of natural vegetation that are to be cleared prior to clearing;	During construction operational phases	Contractor	See above	0
		Areas of natural vegetation that are to be excluded from the development should be clearly demarcated and excluded from the agreement allowing the local community to harvest vegetation.	Before project commencement	SWADE	See above	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
Loss of habitat for species of conservation concern	Areas of untransformed vegetation in the study area support a number of fauna species of conservation concern, particularly large birds of prey, and several of these species potentially breed in the study area. Destruction of untransformed vegetation will decrease the amount of habitat available to these species, and increase the cumulative impact of habitat transformation on species of conservation concern.	All belts of riparian woodland and forest along the Usuthu River should be excluded from the development and a buffer of 100 metres on either side of the river be maintained;	Design stage	SWADE	See above	0
		<p>All riparian zones of smaller tributaries of the Usuthu River, whether perennial or non-perennial, should be excluded from development and a 20 metre-wide buffer should be implemented; these will then act as ecological corridors through fauna can move across transformed habitat;</p> <p>The large tract of <i>Combretum apiculatum</i> – <i>Aloe marlothii</i> Woodland along the eastern border of the study area should be left undisturbed as a buffer with the foothills of the Lebombos to the east; this is key habitat for African Hawk-Eagle, the most threatened species confirmed during fieldwork.</p> <p>Leave the north-central part of the study area (see biodiversity value</p>	Design stage	SWADE	See above	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
		map) as conservation areas and removed from future plans for cultivation				
Increased hunting of animal resources	The potential increase of people into the study area through the development of the irrigation project could result in elevated levels of harvesting of natural resources such as bush meat and traditional medicine.	Areas of natural vegetation that are to be excluded from the development should be clearly demarcated and no hunting should be allowed in these areas; this applies particularly to the broad buffer zone proposed along the eastern boundary.	Before project commencement	SWADE/Traditional leadership	Meetings to establish agreement and policy. Implementation by local authority. Setting up of signboards (700)	200,000

3.2.3 Population and Economy

Table 10: Population and the Economy Impacts Mitigation Measures

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
Increased population density	People may move into the area to take advantage of job and entrepreneurial opportunities. The increased pressure and demand on land may lead to the development	Community leadership should be empowered to control settlements within their jurisdiction. Education on the likely impact of the project on the population density needs to be done with the community	Before project commencement	Community leadership/SWADE	Covered in earlier sections.	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
	and growth of informal settlements.	leadership.				
Transformation of population profile and behaviour patterns	The influx of people in the area, as well mainly males for construction work may lead to increased promiscuity, higher potential for unwanted pregnancies and commercial sex workers.	Local authorities need to be empowered to maintain order within the community. Both temporary and permanent newcomers to the area must be made known to the authorities.	Continuous during project life cycle	SWADE	Police Department to assist in training community leaders. Community Police also to be used.	0
		There is need to have community education and training to manage community reaction to new people in the area.	During project life cycle	SWADE		50,000
Increased employment opportunity	The project will increase the employment opportunities. This will help reduce urban migration, leading to more stable families. The existing skill set within the community is not based on commercial farming. Through training by SWADE, the community will	This is a benefit to the community which should be enhanced by giving locals first preference in jobs where the skill set is available in the community.		SWADE/ Farmers Associations.		0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
	benefit in increased commercial farming and business management skills.					
	Women will not have equal opportunities of being employed in jobs that are considered unsuitable such as cane cutting or security provision.	Women should be encouraged and trained on all aspects of farm activities. The principle of equal opportunities for all needs to be reflected in the constitution of associations.		SWADE		50,000
	Outsiders are often employed on large scale projects if the relevant skill set is not available in the community or that. The high rate of unemployment leads to resentment against outsiders.	Association members need to understand the skills required for employment on farms as well as the principles of employee / employer relations.	Before start of farming.	SWADE		0
Increased financial income	Employment of local population will result in improved income levels for households. This will lead to improved livelihoods, whose effect will impact disadvantaged groups like women and children.	This is a benefit to the community which should be enhanced by giving locals first preference in jobs where the skill set is available in the community. In addition, there is a need for education of employees on financial management to enhance benefit of family members.				0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
Increase in entrepreneurial opportunities	Local SMMEs will benefit from the increase in demand for goods and services that will be required as a result of increased population in that area.	This is a benefit nationally. Local entrepreneurs with the capacity for supply of relevant goods and services to be encouraged to tender.		SWADE		0
Change from subsistence economy to cash economy	The change of the source of livelihood to irrigated agriculture would imply that there would be requirement for more finances to sustain subsistence needs than before the project. Those families that would not be part of the schemes may feel vulnerable.	This impact cannot be mitigated if the project is implemented.		n/a		0
Increased economic status for some	The project will lead to an increased income for some of the community members. The new economic status for some in the population may lead to other members of the community taken advantage of and more vulnerable.	Community leadership to be sensitised on the possibility of this impact	Before project commencement	SWADE		0

3.2.4 Impacts on Public Health

Table 11: Public Health Mitigation Measures

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Increased pathogen transmission	Population density currently at average stands at 66 habitants per km ² in the project. There is likelihood that there will be an increase in population density due to influx of job seekers. Influx of people impact on diseases and family stability by bringing in new strain of pathogens or increase on pathogens dose per person or increase the rate of transmission.	The requirements for housing conditions and density need to be communicated to the community, so that there is awareness around this issue. There is need for education of the community on diseases associated with congestion, how they can be prevented and managed.	Before project commencement	SWADE/Community leadership.	See above	0
Malaria prevalence	Malaria is prevalent and endemic but under control. Thanks to the effort of the Malaria Unit that has been able to put malaria under control in the past decade. There is strong likelihood that the malaria gains of the past few years may be compromised by the project due to small pools of stagnant	Strengthen the malaria control activities by providing funding to maintain the malaria surveillance system and interventions in the project area.	Through project life cycle	Ministry of health (NMCP)/SWADE	See above	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	waters in ditches created due to environmental modification and littering during irrigation. The project is likely to increase in Malaria prevalence in the project area.					
		Community based health education committees should be formed in order to facilitate the malaria control programme especially now that there will be an increase in water bodies. These should be facilitated and coordinated through clinics or public health inspectorate offices in the locality.	Before project commencement	Ministry of health (NMCP)/Community leadership	See above	0
Schistosomiasis prevalence	Schistosomiasis is prevalent and endemic in the project area and there is likelihood that the disease will increase due to available slow moving water in the canal and dam to be built at the end of the canal	Knowing that the control of the disease rest on human behaviours which is influenced by poverty which prescribe the lifestyle of a person there should be a thorough analysis of local characteristics of transmission in order to direct interventions.		Ministry of Health /SWADE	Contracting consultant	50,000

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
		Determine burden of the disease through urinary and stool. Conduct surveys frequently to monitor for change in disease burden.	Continuous through the life of project	Ministry of Health/ SWADE	Material and logistic assistance to district health staff	150.000 (3 years)
		In conjunction with the government and based on the survey results support school based control programs to reduce the burden of disease due schistosomiasis.	Continuous through the life of project	Ministry of Education, SWADE, Ministry of Health.	Preparation of education material Education activities/ targeted treatment and medicine, preventive chemography, testing of sanitation facilities	20.000 150.000
		Support improvement in sanitation practices in the project area.	Continuous through the life of project	SWADE	May be difficult during construction period. But is major project output from	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
					2015 Costs are included in costs for main project.	
		Support improved water supply to the local community as part of an effort to prevent communities to have contact with the river / canal or dam waters.	Continuous through the life of project	SWADE	20 footbridges at E 40.000	700.000
		Construct foot-bridges at convenient places on the canal to prevent people from having contact with the water.	Construction phase	SWADE	Contract consultant/p public health expert	20.000
		Design the canal and the dam such that it does not support the breeding of snails.	Design stage	SWADE	See above	0
		Provide work areas with proper and sufficient toilet facilities.	Continuous through the life of project	Contractors/ Farmers Association	Establish code of conduct. Issue information material. Set	20.000

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
					up posters. Meetings with employees and site officials	
		Conduct information education communication campaigns to the workforce on proper hygiene and sanitation. Educate employees not to urinate and defecate in any open water source. A code of conduct should be in place to manage this.	Continuous through the life of project	Ministry of Health/	Establish code of conduct. Issue information material. Set up posters. Meetings with employees and site officials	20.000
		Ensure adequate potable water and sanitation services are available for the work force to use.	Operational phase	Farmers Association	See above	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
		As part of the pre-employment examination and continuers' medical examination, a prospective employee or employee that has blood in the urine should have schistosomiasis excluded and treated.	Operational phase	Famers Associations	Treatment, medical costs and lab testing	20.000
Increase in HIV/AIDS	HIV/AIDS is prevalent in the project area. The disease is likely to impact negatively to public health due to the manner in which it is transmitted. Influx of people will exacerbate the prevalence of the disease normally workers are males who don't bring along with them their wife because the conditions at such work environment don't allow them to bring their spouses due to lack of accommodation. Hence they turned to take local women as companion for the time being at work place. This behaviour increase the prevalence of diseases like HIV/AIDS, TB,	Develop a HIV/AIDS management programme that will target community factors that predispose community to acquiring the disease. Support equal employment opportunities and develop a strategy that will encourage women to take up jobs that are known to be exclusively for men.	Operational phase	SWADE/ Ministry of Health	See above	0
		Develop strategies that create alternative opportunities for women to reduce the potential for commercial sex work within the project area.	Operational phase	SWADE/ Ministry of Health	See above	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	syphilis, gonorrhoea and genital warts.	Reinforce HIV/AIDS programme that facilitate peer education in the community. These should have a gender focus in both men and women with the intention to empower women to refuse to be abused sexually. The focus should be driven toward behavior change for casual and high risk sexual behavior change.	Operational phase	SWADE/ Ministry of Health	See above	0
Water borne diseases	Water borne diseases are prevalent in the project area. Mostly are experienced during rainy seasons and contribute significant number of patients in the clinics that are in the area. Diseases like cholera;	Develop a strategy in conjunction with the chiefs to manage the water schemes and sanitation programmes.	Operational phase	SWADE/ Community leadership	See above	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	<p>typhoid; diarrheal and dysentery are the most prevalent diseases in the project area. The project is likely to impact positively because there project come with a component of clean water supply for domestic use. Water-borne diseases are going to reduce after the implementation of the project. Issues of children under 5 years who do not use pit toilet and medical waste generated from home base care activities water down the gains made by clean water supplies.</p>	<p>Develop a system for sanitary excreta disposal system that can operate effectively in water logged places. This is because the soils of the project area are said to have high water table and ordinary VIP latrines are not suitable now that irrigation will contribute significantly to rise in water table.</p>	Design stage	Water and Sanitation Design consultant		0
		<p>Design a method of medical waste disposal suitable for home base care activities. The system should consider the pattern and distribution of home base care patients in the project area.</p>	Before project commencement	Ministry of Health/ SWADE	Covered under construction phase	

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
		Enforce health education on sanitation and solid waste management within the community.	Continuos through project	SWADE/ Community leadership/ Farmers Associations.		
		Ensure adequate onsite solid waste management to prevent environmental pollution.	Operational phase	Farmers Associations/ SWADE		
Food available, quantity and quality	The Swazi staple food is maize, that is the source of starch for the Swazi nation and the community in the project area is no exception. The project is likely to impact positively on food quality and quantity. This is causes besides the planting of sugar cane, farmers will also have 0.5 of a hectare where they will plant maize and they will also have plots to grow vegetables. This will give communities balance diets which will impact positively on those diseases are prevented	Assure access to land for orphans and vulnerable children who are heads of the families in the society this will go a long way in solving food shortage in disadvantaged homes.	Before farming operation starts	Community leadership		
		Perform a baseline nutritional assessment in children under 5 and also micronutrient deficiencies and surveillance on nutrition status. This will guide how and what should be encouraged in the small garden crops.	Before farming operation starts	SWADE		

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	by eating balance diet.					
Work related accidents and ill-health e.g. Traffic accidents and dust	Experience of LUSIP I indicate that there will be accidents and injuries during operation of the irrigation scheme. If not mitigated the project can impact negatively to the workers and the community. If not mitigated this can be a serious problem	<p>Develop emergency response plans for both community and work place related accidents management.</p> <p>Initiate and facilitate community education programs on road safety.</p> <p>Establish an appropriate emergency response and emergency medical stabilization facilities at the project site. The project will require a small stand-alone Medical service to cater for emergency and limited occupational health care for the workforce at a minimum. This is because the local health care facilities are not equipped to support these activities.</p> <p>Develop training programs on First Aid based on local requirements and international best practice.</p> <p>Standardized first aid kits must be</p>	Before farming operation starts	SWADE/ Farmers associations/ Local Police		

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
		available in all vehicles, work areas and offices.				
Increase in Drowning	Experience of LUSIP I indicate that the project may impact negatively to the community especially children who, despite of warnings and fencing of the dam and canal, they continue to cut fence and access the canal.	Develop a recreation facility in each chiefdom that is Ngcamphalala, Matsenjwa and Mgommetulu.	Before project commencement	SWADE	To be implemented after end of project when water is available	0
		Develop a programme that will educate communities on the dangers of using the dam or canal for swimming purposes or for fetching water or washing ones cloths. Parents should be at the forefront to make sure that their children don't use the irrigation facilities for whatever purpose.	Construction phase	SWADE	Instruction to parents, teachers (pamphlets for 2000 households, posters)	40,000
		Schools, starting from pre-schools should facilitate the transfer of the message on the dangers posed by using the canal and the Dam for whatever purpose	Construction phase	Ministry of Education	Meeting with teachers, awareness campaign in schools, pre-schools and at household level (supported	20,000

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
					by education material and curriculum) – see also above	
		<p>Use of diamond mesh fence where canal passes close to dense settlements to prevent access by children.</p> <p>Involve the communities to guard and maintain the fencing along the canal.</p>	After construction of canal	Community leadership/ SWADE	<p>Strategy development and implementation at local authority level/Tinkhundla level. Establishment of maintenance teams (fencing material for first 3 years)</p> <p>Labour (10 teams of 3 local staff to maintain 5 km each over 3</p>	<p>80,000</p> <p>30,000</p>

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
					years)	
		Design and construction of adequate and safe bridges for people and vehicles.	Design and construction phase	SWADE	Footbridges – see above Bridges for vehicles (5 bridges x E 50.000)	250,000
Exposure to toxins	Most toxins the community or workers may be expose to, are discarded and absolute chemicals mostly used for insects control in agriculture. This may impact negatively if not mitigated.	Train famers on chemicals handling and management. They should manage chemicals and hydrocarbons as per material safety data sheet to avoid environmental and safety risks.	Operational phase	SWADE	Pamphlets and trainers to advise farmers associations	20,000
		Provide an environmental monitoring programme to monitor agriculture chemicals through runoffs from the fields and the airborne.	Operational phase	Farmers Associations	Ministry of environment and agriculture staff to draft programme (transport, workshops)	15,000
		Storage structures to restrict exposure of workers to dangerous chemicals.	Operational phase	Farmers Association/ Ministry of	Instruct farmers associations	

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
				Agriculture	when establishing sheds according	
Hospital, clinics accessibility	There are three clinics in the project area. Bholi clinic which is mostly servicing community at Ngcamphalala, Lubulini clinic servicing mostly Mngometulu community and Ndzevane clinic servicing mostly Matsenjwa community. These clinics considering proximity to the community seem to be adequate, however the community complain that none of the clinics is able to admit patients yet with the burden of HIV/AIDS there is a need that patients sometimes are admitted. This will now be a demand that one clinic is upgraded to a health centre or hospital considering the magnitude of work to be done and the influx of job seekers.	One of the clinics in the project area needs to be upgraded to a health centre to admit patients	During construction phase	SWADE/ Ministry of Health	See above	0
Effects on housing	Housing settlement is according to the Swaziland	Community should be sensitised on the importance of house	Continuous through project	SWADE/		0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	Policy of settlement where there is clearly defined area for agriculture, residential, and livestock. Residential is along the hillsides or settled along the roads. Currently at average there are 6 people per households. There is likelihood the population will increase considering the activity that will take place. This will impact negatively to public health because some immigrants would want to be accommodated within the community and that communities are likely to lure them to make money on rents. This will cause congestion and diseases like TB might rise. State of household hygiene might be compromised due to difference in habit of new comers.	hygiene and measures to keep safe from diseases.	life	Ministry of Health		
Ratio of patient to health worker at health facility	The increase in the population of the area, with the increased expectation of job opportunities in the farms will increase the patient to health	The upgrade of one clinic to a health centre will mitigate this impact	Construction phase	Ministry of Health/ SWADE		0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	worker ratio in the health facilities of the area.					
Drugs and alcohol abuse, social cohesion and crime.	There is likely-hood that community members will see an opportunity to conduct business of selling alcohol to the workers. This can go as far as opening of shebeens business in their residents where the workers would congregate to drink. This may cause social instability, drugs and alcohol abuse, domestic violence, disturbance in social cohesion and crime.	Develop a health education program that will target the communities and workers on domestic violence and substance abuse.	Before project commencement	Ministry of Health	Covered under construction phase	0
		Work with Chiefs to control shebeens operation in the area.	Before project commencement.	Community leadership/ SWADE	Covered under construction phase	0
		Support community leadership at the local level to reduce the potential for increased domestic violence.		Local Police	Covered under construction phase	0
		Strengthen country's policing and laws to manage cases of domestic violence, public drunkenness and substance abuse by reinforcing the training of community police.		Local Police, Community Police	Covered under construction phase	0
		Develop a specific workplace substance abuse policy and programme that incorporate health education at the workforce on substance abuse and domestic		SWADE	Covered under construction phase	0

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
		violence.				

3.2.5 Climate Change Impacts

Table 12: Climate Change Mitigation Measures

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
Increase of the crop water requirement	The scenario tested, the climate change would have an impact on the crop requirement, which will increase up to 5% or 10%.	Installation of water meter for each irrigation scheme, for monitoring of water use.	Before start of farming operations in each farm.	Farmers Association	Workshop assessing monitoring and reporting procedures and strategy development	20,000
		Use tariff structures that encourage efficient use of water and training of farmers on efficient use of water.	Before start of farming operations in each farm.	Farmers Associations	50 schemes at E 500/ each	25,000
Reduced Water resource availability	The projected changes in rainfall and Evapotranspiration data in are small so it's logical to find here a very small impact of Climate Change on	Monitoring weather patterns and formulation of adaptation strategies.	Operational phase	Farmers Associations/ SWADE	To be elaborated by water authority. Costs thus	0

	the runoff.				covered by water fees.	
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3.2.6 Air Quality Impacts

Table 13: Air Quality Mitigation Measures

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
Emission of gases during burning of sugar cane	If burning is done during harvesting of sugar cane, there would be emission of gases like POPs, SOx, NOx, particulates, which may be a nuisance and cause pollution of the atmosphere. Green house gases may also be emitted, contributing to climate change.	Exploration of viable alternatives to burning of sugar cane during harvesting	Continuous through project life.	SWADE/Ministry of Agriculture		20,000
Emission of gases from transportation of cane to Mill	During transportation of sugar cane for processing, there will be emission of gases like sulphur, oxides of nitrogen and other gases that may cause air pollution.	Use of clean fuel (low sulphur, metal free gasoline). Use of haulage trucks that are regularly serviced.	Operational phase.	Farmers associations/transport contractors.	Transport service provider needs to be encouraged to use clean fuels	0

3.2.7 Impacts on Livestock and Rangelands

Table 14: Livestock and Rangelands Mitigation Measures

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Reduced quality and quantity of grazing area	<p>When project implementation begins there will be reduced the available grazing land, which will lead to potential overstocking and subsequent decimation of the grazing resource leading to a marked loss of livestock productivity as well as potential stock losses.</p> <p>The calculated current stocking density in the entire project area is 0.75 hectares per livestock unit (450kg bovine), whereas the recommended stocking density of the area ranges from 2.8 to 3.8 hectares per LSU. On commencement of the project this cropping land will be reclaimed for crop production, leaving the animals with even less land available for grazing hence the land and vegetation will not be capable of sustaining the large numbers of animals.</p>	Fence off the grazing land to prevent further disturbances. The land should then be left undisturbed to allow the native grass and other plant species to be re-established. The grass should be allowed to grow, flower and disperse seeds. Once the first growing season is complete and the seeded grass germinates and takes hold, livestock can then be allowed to return to graze sustainably in a rotational sequence after the grazing land has been divided into paddocks.	Construction phase	SWADE	Fencing of paddocks for about 7,000 cattles or 14,000 ha (1 LSU = 1 ha x 2) with iron wire covering an area with a length of 12,000 m. 71 tons of wire at \$ 800	475,000

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Increased invasion of IAS	There is increasing ground coverage of the alien invader species weed <i>Parthenium Hysterophorus</i> , which is a definite sign of disturbance and overgrazing.	An AIS Control programme to be in place and implemented to control encroachment of invasive alien species to rangelands.	Construction phase	SWADE	To be included in above IAS measures	0
Reduced access to drinking water for livestock	Grazing patterns in the project area indicate that farmers would like to keep the animals in close proximity to the river for drinking water. Fencing off some areas for crop farming and along the canal route will decrease the access points of livestock to water.	There is a need for the provision of drinking water for livestock in all the designated grazing areas. The water requirement for beef cattle is on average about 40 litres/day and about 95 litres per day for lactating dairy cows.	Construction phase	SWADE	Establishment of 6-8 communal grazing areas to be provided with water from pipe. Pipe length in total 8 - 10 km at \$ 25/ m	2,075,000
Depreciation of health of livestock	If the animals are confined within overgrazed pastures on commencement of the project, will have insufficient grazing and as a result would start consuming alien invasive plant species. The more abundant <i>Parthenium</i> contains a toxin known as parthenin, a sesquiterpene lactone	The clearing of weeds from the grazing areas before animals can be confined in them. A recovery period would also be necessary to reduce the allelopathic chemicals released by the weeds into the soil in order to give the native grass species and other vegetation the chance to recover and be well established so as to facilitate	Construction phase.	SWADE	Clearing of weeds (community staff with some instruction). About 7,000 ha grazing area. Clearing of 1	1,000,000

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	(Narasimhan et al, 1984). This weed is therefore pathogenic to both livestock and people, causing rhinitis, fever, rashes, ulcerations and necrosis in cattle (Singh et al, 2010). In extreme cases of toxicity this toxin has been known to cause death of both cattle and water buffalo.	grazing of livestock.			ha = 50 man/days Mainly volunteer work	
Increased Disputes	The reduction in grazing area may lead to livestock encroaching into commercial farms, and sometimes the herders cut fences to along the livestock to pass through. This will lead to more cases of livestock impoundment, leading to increased strife between neighbouring farm owners and the community.	A proper procedure for the impounding of cattle needs to be developed with the community and disputes settled locally.	Construction phase	Community leadership		0
Increased livestock drowning accidents	The canal will increase incidences of drowning of livestock. This may be more pronounced if there are not enough watering places for animals.	Construction of properly designed livestock bridges, according to livestock grazing patterns.	Construction phase	SWADE	Covered by foot and vehicle bridges (also to be used for	0

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
					cattle)	

3.2.8 Water Management

Table 15: Water Management Mitigation Measures

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Chemical Pollution	Improper storage of chemicals and fertilizers may lead to these chemicals finding a way to water resources, leading to pollution of rivers and streams, affecting the quality of downstream users of the water. Surface runoff from these areas is also likely to show increased levels of nutrients derived from the leaching out of fertilizers.	<p>Training of farmers on agrochemicals management and environmentally sound chemicals management (pesticides and fertilizers).</p> <p>Training of farmers on application and management of residues, wastewater from cleaning, proper irrigation practices. etc)</p> <p>Putting in place Simple Operation Procedures for management of spillages</p> <p>Designation of areas for maintaining of farm machinery</p>	Before commencement of farming periodically after that.	SWADE	<p>Develop training programme</p> <p>Training of farm managers and lead farmers. Continuous training activities (120 courses at E 5,000/each (transport allowance, etc)(</p>	<p>50,000</p> <p>600,000</p>

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Eutrophication	Nitrate and phosphate levels will also be increased, particularly during the wet season and after the current practice of burning the cane residues. Phosphate levels are currently high in the lower Usuthu, and any further increase will heighten the current risk of eutrophication	Runoff management system designs	Design stage	SWADE/Farmers Associations	Role of river basin authority and/or water company/ association/ authority to be formed. Concerns also district authority Monitoring and reporting procedures to be strengthened and to be implemented. Improved lab facilities and transport	0 300,000
Potential decreased water quality in the Mhlathuzane River as a result of	Controlled releases from the Lubovane Dam results to poor water quality in the river downstream of the dam wall. This could have a direct effect	Regular monitoring of water quality, Identification of pollution hotspots and implementation of corrective	Continuous through project life	SWADE	Check with master plan, design study finalised in	0

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
releases from the Lubovane Dam	on fish and invertebrates intolerant to changes in water quality. Eutrophic conditions may develop in the river if the compensation flows have a high nutrient status, leading to deoxygenation and fish kills.	measures			May 2012.	
Pollution of groundwater	The VIP toilets that will be supplied under the project may lead to pollution of groundwater resources if the toilets are sited and designed with no consideration of the porocity of the soils and the water table level. Improper irrigation practices and application of agrochemicals may lead to the leaching of agrochemicals into groundwater.	Design of sanitation facilities to take into consideration water table of the area.	Design stage	Design Consultant	See above	0
		Efficient use of irrigation and agrochemicals to minimise leaching into groundwater	Operational phase	Farmers association	See above	0

3.2.9 Social Facilities

Table 16: Social Facilities Impact Mitigation Measures

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
Increased demand for social services	The introduction of new people in the area will lead to an increased demand for education (increased teacher: pupil ratios), increased demand for police services (increased crime rates).	The Police Department and all relevant ministries (education, health) to be engaged in ensuring that the services are able to meet the increasing the demand.	Before project commencement	SWADE/Relevant Government Departments	See above	0
Increased demand for recreational facilities	The project is likely to lead to an increase in the demand for recreational facilities due to increase in local population.	Develop a recreation facility in each Chiefdom that is Ngcamphalala, Matsenjwa and Mgommetulu.	Construction phase	SWADE	See above (Public Health)	0
Increased public traffic load	There will be an increase in the demand for transport for buses and other public transport as a result of the increase of population in the area.	n/a			0	0
Inhibited access to resources and services	The construction of structures, including the canal will lead to the discontinuation of pathways that are normally used by the community to access fuelwood, neighbours, grazing land and	Foot bridges to be constructed to cater for community needs, therefore community to be consulted on suitable crossing areas.	Construction phase	SWADE	20 footbridges at E 40.000	700,000

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost (E)
	other services.					
Improved Portable water supply	Access to water will be restricted especially as rivers and tributaries will be curtailed by the setting up of irrigated farms. The project plans to improve access to portable water thereby improving the health and safety of the community.	Support improved water supply to the local community as part of an effort to prevent communities to have contact with the river / canal or dam waters.	Continuous through project life cycle.	SWADE/Community leadership	Covered under the Water Supply and Sanitation Component of the project.	0
	Operations and maintenance of water supply systems have been a challenge to most communities in the past.	Develop a strategy in conjunction with the chiefs to manage the water schemes and sanitation programmes.	Continuous through project life cycle.	Community leadership/SWADE		

3.2.10 Community/ Social Organization

Table 17: Community/Social Organization Mitigation Measures

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Land Disputes	Conflicts and disputes involving SNL may arise from several causes, e.g. within a chiefdom due to competing allegiances to different chiefs; between neighboring chiefdoms, which include claims on the same territory, and between local chiefs and other parties owning, leasing, or granting use rights to non-SNL land within a chiefdom's territory. The implementation of the project may further exacerbate these disputes when people under a chiefdom are putting together a scheme.	The community should participate in any decision making process which affects their development and/or the distribution/ reallocation of their lands. Settlement of chiefdom boundary disputes needs to be facilitated.	Construction phase	SWADE/RA's Office		0
Disruption of community organizations and social groupings	The introduction, movement and relocation of people will change the profile of the population in the project area, resulting in the disruption of the original social setting. The support networks between	Resettlement options should avoid breaking up communities, because the maintenance of the social networks linking members of the affected communities may be critical to the successful adaptation of those communities to their new	Construction phase	SWADE/Community leadership		0

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	neighbours and with community based organization may be severed when resettlement occurs.	<p>circumstances. Though community preservation is a primary concern, some members of the community may have other settlement preferences, including a preference <i>not</i> to remain part of the affected community. For this reason, all community members should be consulted and provided with appropriate options for resettlement. Experience from LUSIP I shows though that homesteads may prefer to relocate not far away from the canal so to benefit from the development of the project.</p> <p>Traditional authority should be engaged to facilitate the identification of host areas. The people in the potential host areas should engaged to encourage their cooperation as the land for resettlement is identified.</p>				
Increase in social cohesion	The formation of farmer schemes will lead to the increase in social cohesion, especially within those in the same farmer association.	This is a positive impact, which requires no mitigation	n/a	n/a		0

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	Information exchange and cot sharing between the different farmers associations may also increase positive social interactions.					
Increased Grievances	Community members are concerned that whilst their grievances may be noted throughout the project cycle, these may not be attended to. It is perceived among the community that other national infrastructure projects do not adhere to the regulations on environmental and social impacts.	A grievance procedure should be drawn up. A strict timeframe for attending to issues should be outlined & adhered to.	Construction phase	Community leadership.		0
Relocation of homesteads as a result of development of irrigation schemes	During the development of irrigation blocks, homes, graves and other assets will be relocated to give way to the farming operations. 21 homesteads, 2 dip tanks and 3 soccer fields will need to	Development of irrigation blocks should not be started before affected people are relocated and compensated as agreed. Identification of host		SWADE/Community leadership.	21 homesteads , 2 dip tanks and 3 basic soccer fields in the irrigation blocks	10,027,19 7.82 ²

² Includes: E 9,647,012.11 for homesteads, E 316,800.00 for Dip tanks and 63,385.71 for Soccer Fields. It does not include other structures such as graves, kraals, fruit trees etc.

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
	relocated.				(3942ha)	

3.2.11 Soils

Table 18: Soil Impact Mitigation Measures

Impacts	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Increase in sodicity in concave colluvial soils	Inadequate drainage, increased bedrock weathering and low conductivities in some areas within the project area will lead to increase sodicity in these areas.	Training of farmers on agrochemicals management and proper irrigation practices	Operational phase	SWADE	These are covered under Water Management impacts.	0
Decrease in soil organic content	The intensive cultivation of crops and burning of sugar cane may lead to a decrease in organic content for the soils, especially S-sets.	Exploration of viable alternatives to burning of sugar cane during harvesting	Operational phase	SWADE	Costs are covered under Air quality impacts	0
Increase in groundwater salinity and nitrate content	The application of fertilizers, which contain high nitrates may lead to leaching of the nitrates to groundwater.	Efficient use of irrigation and agrochemicals to minimise leaching into groundwater	Operational phase	SWADE	Costs are covered under water Pollution	0

3.2.12 Waste Management

Table 19: Waste Management Mitigation Measures

Impact	Description	Mitigation	Timeframe	Responsibility	Comment	Cost
Improper solid waste management from farm operations	During farm operations, waste will be generated. Some of these waste streams are hazardous (empty chemical containers, expired chemicals, etc)	Training of farmers on sound environmental management: Each farmer irrigation scheme to have an environmental management plan that would include management of various solid waste streams.	Operational phase	SWADE/SEA	Min. of Agriculture and Environment to work out plan prior to farm establishment. 10 workshops Educational activities at farm level (material, transport). Upgrade training of district staff.	50,000 + 50,000

3.2.13 Gender and Human Rights

Table 20: Gender and Human Rights Mitigation Measures

Impacts	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
Economic Empowerment for women	Possibility of economic empowerment for both women and men under the LUSIP II, through commercial farming and participation in downstream activities;	Community, especially women need to be trained in management of finances to enhance this benefit.	Operational phase	n/a		0
Acquisition of New skills	Possibility of women acquiring new competencies that will broaden their economic activity scope through training in skills such as, leadership, construction, driving. Communities will also learn the positive aspects of equal participation by women and men in development;	Awareness raising and empowerment training for the traditional leadership, husbands and women on relevant gender and human rights issues must be undertaken to facilitate the socio-cultural transformation necessary that the LUSIP benefits all without discrimination and also promotes the attainment of Millenium Development Goals targets at national level;	Before project commencement	DPM's Office (Gender Unit)/SWADE	Training of various community groups	20,000
Unequal access and participation of women	The treatment of married women as "strangers" and single women as "migrants" in the communities makes equal participation a challenge and	As an initial step until community members get used to working together, equally as teams, to committees to the committees women who by virtue of their current occupation are likely to better able to lead or speak out in an intimidatory	Before project commencement	SWADE		0

Impacts	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
	promotes the marginalization of the women from the development process; That use of head of household for registration under LUSIP presents a challenge to ensuring equal access and participation of women and men, women still participate in representative capacity. The use of the head of household or man as main beneficiary/player under the LUSIP exacerbates the women's vulnerability to poverty as their ability to earn income and retain their earning ability is subject to a man's whims, more especially because of the practice of polygamy.	environment, e.g., teacher, hotel worker, RHMs; LUSIP II staff needs to train/empower and use members of the more "progressive communities" within the PDA to build the capacity of the other community members in cooperative work between men and women. For example, at the Matsenjwa community, the men-women power relations dynamics during the Scoping Meetings displayed a community, which even though not perfect, have better working relations between its leadership;				
Reduced benefits to families	Given that data reveals that men do not usually plough money gained back into family welfare, but would rather buy a car in the face of family indigence, for example, the incidence of poverty at	There is need to review the use of head of household for registration purposes so that women can participate in the farmers groups directly and have security of tenure; There is need for advocacy by SWADE/LUSIP for the formalization of the existing Draft National	Before commence ment of farming operations.	SWADE/Ministry of Justice/Ministry of Agriculture.		0

Impacts	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
	the household level is a high risk given the fact that land is registered in man's name and thus directs money to him;	Land Policy and the review of the Companies Act of 2009; That an amendment of the Companies Act 2009 be advocated for in order to legalize the payment of dividends into a family trust in order to protect the women from economic exploitation and injustice;				
Marginalisation of women	The marginalization of women from the lucrative downstream activities because of lack of the relevant skills, such as, construction and driving skills. The exclusion of women from better paying farming activities such as, cane cutting, because of existing stereotypes about women's suitability and capacity here;	Guidelines need to specify 50:50 men and women representation in the management structures and that women must also be appointed to positions of chairperson as opposed to being secretaries;	During formation of farmers associations	Farmers associations.		
		Put guidelines to stipulate that the person who works in the farmers association is one that gets money;	During formation of farmers associations	Farmers Associations		0

Impacts	Description	Mitigation/Enhancement	Timeframe	Responsibility	Comment	Cost (E)
		There is need for affirmative measures to accommodate women's weak economic and financial status, for example, training in skills to enable them to benefit from downstream activities as the men do, reduced tariffs to projects costs and loan requirements reduced for women;	During formation of farmers associations	SWADE/Farmers associations		20,000
Reduced access to natural fuelwood	The clearing of vegetation will lead to a reduced supply of firewood which impacts more on women who are expected to prepare meals for their families.	Explore opportunities for establishment of woodlots Encourage planting of trees and where suitable, explore opportunities with the SEC rural electrification programme. Promote the use of fuel efficient woodstoves.	During construction phase	Ministry of Agriculture/SW ADE/MNRE (Energy section)		60,000

3.2.14 Transboundary Impacts

Table 21: Transboundary Impact Mitigation Measures

Impact	Description	Mitigation Measure(s)	Responsibility	Timeframe	Cost (E)
Inability to maintain minimum flows	Inability to maintain minimum flows in the Usuthu River downstream from off-take at Bulungapoort and at international borders to RSA and Mozambique	Reduce or curtail further abstractions until minimum flow is restored/use of available offline storage/institute water conservation measures	Notification: DWA/Usuthu River Basin Authority Implementation: SWADE	Operational phase	0
Non availability of Water	Non-availability of water for allocation to LUSIP due to high priority upstream uses	Prior notification of LUSIP management Reduce or curtail further abstractions until required minimum flow is restored/use of available offline storage/institute water conservation measures	Notification: DWA/Usuthu River Basin Authority Implementation: SWADE	Operational phase	0
Inadequate drainage	Inadequate drainage of excess water resulting in waterlogging and increased soil salinity	Monitoring and extension advice , improved on-farm management to improve drainage	Notification: LUSIP management Implementation: FAs/farm management	Operational phase	50,000

	Accumulation of toxic agrochemical residues in surface and groundwater	<p>Regular monitoring of chemical water quality at tail-end reservoir and in designated observation boreholes</p> <p>Increase use of organic/biodegradable fertilizers and pesticides</p>	LUSIP and farm management	Operational phase	0
	Contamination of drinking water supplies	<p>Regular monitoring of water quality for turbidity, presence of toxic chemicals and pathogens at outlets of treatment plants, main service reservoirs and a sample of public tapstands and boreholes used for domestic drinking water</p> <p>In the event of an outbreak of disease, public health authorities should be notified and intervene.</p>	LUSIP management, reporting to regional and local public health authorities	Operational phase	0

4. ESMP SUB-PLANS AND MAJOR CONTRIBUTING REPORTS

4.1 Resettlement Action Plan

4.1.1 Introduction

While poverty alleviation and livelihood diversification is the main outcome of the project, its implementation will lead to a number of short-term impacts that will require mitigation and management. These include the acquisition of land (mainly Swazi Nation Land) and population displacement. The overall aim of the Resettlement Plan is to ensure that all resettlement-related impacts associated with the construction of the project's bulk infrastructure are addressed.

4.1.2 Resettlement Estimates

A total of 22 homesteads are within the preliminary canal alignment (excluding homesteads within the irrigation blocks). Of these households, 19 will definitely be displaced and require resettlement since they fall within 100 meters of the preliminary canal alignment. Some of the affected homesteads (3) are located outside the periphery of the canal, may be affected by blasting.

The resettlement impact associated with the development of the irrigation blocks, which is yet to be confirmed, has been adjusted to 21 homesteads. These have to be resettled. It can be noted that the area in the irrigation blocks has been reduced by 170 ha in order to prevent the resettlement of another 21 homesteads and to ensure that 1 ha per remaining homestead is reserved as buffer where no cane production is allowed. One (1) dip tank is affected by the canal and one (1) basic soccer field will also have to be relocated. There are two (2) dip tanks that are located within the irrigation blocks, one (1) Umphakatsi – Mngometulu and three (3) basic soccer fields located in the irrigation blocks. Additional assessments have to be made during the detailed design phase.

A total of 41.64ha of arable fields are affected to varying degrees by the preliminary canal alignment and reservoir at the end of the canal. There are 54 graves that will be affected. There is only one shop that could be impacted by the resettlement of the affected homesteads. This though may be as a result of whether the homesteads are resettled far away from their current locations. Experience from LUSIP I shows though that homesteads may prefer to relocate not far away from the canal so to benefit from the development of the project.

4.1.3 Consultation and Participation

A community participation process was initiated in 2000 to establish a representative community consultation and participation structure through which the people of the Lower Usuthu could participate in the planning, design, and implementation of the project.

Consultation and participation in resettlement and compensation planning has thus far occurred at homestead, sigodzi and uMphakatsi level. Individual and group/community consultation will continue during project implementation to clarify resettlement choices and compensation principles and rates, and to ensure that affected homesteads fully understand their entitlement packages.

4.1.4 Compensation and Livelihood Restoration

The project's compensation policy is embodied in an Entitlement Framework which was approved by the CDC in April 2003. The overall aim of the Entitlement Framework is to ensure that the different categories of affected homesteads area treated fairly so that none are worse off than prior to project implementation. All homesteads displaced by project activities, as well as non-displaced homesteads whose assets are acquired by the project, will be entitled to the provisions detailed in the Entitlement Framework. The Entitlement Framework defines and specifies:

- the categories of affected homesteads and eligibility criteria;
- resettlement and compensation principles;
- compensation entitlements; and
- compensation determination and funding

The compensation principles established by the CDC formed the basis for the establishment/ adjustment of compensation rates for the various items detailed in the Entitlement Framework. The principles were finalised through a process of defining options, costing these, work-shopping and then agreeing on the principle and rate. This was summarised in the document "Entitlement Framework - Final (April 2003)" and then summarised in "Entitlement Framework - Summary Final Update (April 2003)".

It is the stated aim of SWADE that all displaced households should benefit from the primary irrigation development. A cascading package of benefits has been developed to ensure that all displaced households will benefit from the project. The proposed package of benefits includes training, access to finance, project development business opportunities, food production and commercial projects.

4.1.5 Resettlement Options and Measures

Two broad resettlement options are being proposed: relocation within the project area; and free choice resettlement. Relocation within the project area entails relocation within the project area, either individually to a new site identified by a homestead, or as a group of homesteads to a designated resettlement site. Free choice resettlement entails resettlement to a new site identified by the homestead that is located outside both the homestead's chiefdom and the defined project area.

At present, all the resettler homesteads have indicated that they would prefer the first relocation option, i.e. relocation within the project area. This is mainly encouraged since the main objective of the project is to bring water closer to the people so that they can turn from subsistence farming to commercial farming. Mainly, single homestead resettlement sites have been identified as the preferred option along the canal network for homesteads from Matsenjwa, Ngcamphalala and Mngometulu chiefdoms that will be displaced for the construction of the canal.

Each site has to be surveyed by the LUSIP 2 Agricultural Team to determine soil suitability, while access to social services and water supply options should be assessed by SWADE's Health Team. Water supply alternatives considered both interim and long-term supply options with the longer term options including water distribution to every homestead in the project area.

Construction of replacement housing is proposed to be undertaken according to the following methods:

- a) homesteads can choose to have their houses constructed by conventional construction (i.e. a Project-appointed contractor); or
- b) homesteads can choose to have their houses constructed by a contractor of their own choice; or
- c) homesteads can undertake the construction themselves (owner-builder).

At this stage, LUSIP 2 team should expand on the above options based on lesson learnt from LUSIP 1 but it is advisable that these options are considered based on the construction schedule of the canal. Debushing and terracing will be the responsibility of the Project. Debushing of homestead sites will be selective and as many trees as possible will be left undisturbed.

4.1.6 Implementation

As the project authority, SWADE will assume overall responsibility for the implementation and coordination of resettlement activities. It is proposed that project implementation, including implementation of the resettlement programme, should be managed and coordinated at two levels: the SWADE Site Office, and an institutional and participation structure to ensure ongoing involvement of communities in decision-making processes. A detailed resettlement implementation schedule, which details activities, responsibilities and timeframes, will be developed in line with the construction schedule.

4.1.7 Cost Estimates

The total compensation costs for homesteads affected by the canal are estimated at E11,907,191 (projected to mid-2014 values). These estimates exclude:

- resettlement planning and implementation costs;

- mitigation of communal resources(e.g. securing of alternative grazing lands);
- final design costs;
- monitoring & evaluation costs;
- government or parastatal administration costs (including administration of contracts);

Costs to be borne by the farmers' organisations in the development of irrigation blocks and other development areas; **Please note that there are 21 homesteads estimated to be affected in the irrigation blocks and need to be resettled.**

4.1.8 Monitoring and Evaluation

The project has an obligation to ensure that resettled homesteads regain, and preferably improve upon, their living standards. The measures detailed in the Resettlement Plan are designed to meet this obligation. In turn, the implementation of these measures and the extent to which objectives are being met, require proper checking and assessment. A monitoring and evaluation programme will accordingly be implemented to record and assess project inputs and the number of persons affected and compensated; and to confirm that former subsistence levels and living standards are being re-established. The monitoring programme will have three broad components:

- performance monitoring;
- impact monitoring; and
- a completion audit.

An Environmental Review Panel will have to be appointed to provide guidance to the project's resettlement programme. Comprising of specialists with expertise in resettlement, development and environmental processes and practises, the Panel will undertake the overall evaluations of the resettlement and livelihood restoration work being done under the project.

5. ENVIRONMENTAL AND SOCIAL MONITORING PLAN

5.1 Compliance Monitoring

5.1.1 *Pre-construction and Construction phase Monitoring*

During the project preparatory stages, the proponent (SWADE) and the financing partners would ensure that the measures outlined in the ESMP are complied with. When the construction phase commences, it is expected that a supervising consultant (Engineer) be appointed to ensure compliance of the construction contractor.

The project Management Unit will prepare periodic project compliance reports to the Swaziland Environment Authority. It is also expected that there would be regular audits by the financing partner.

With respect to implementation of the Resettlement Action Plan (RAP) it is important that identification, acquisition of land is done prior to any project activity. Compensation or restoration for affected community needs to be done before any construction activity starts. Before the construction phase starts, it should be ensured that this requirement is done satisfactorily.

- During construction the SEA will have a role, in periodically checking ESMP implementation by reviewing the project compliance reports and routine site inspections.
- The financing partner will conduct periodic supervision missions.

5.1.2 *Operation Phase Monitoring*

- Periodic preparation of Project Compliance reports will be prepared by the proponent (SWADE), and the SEA, through review of reports and regular site inspections will ensure that the project is implemented in compliance with the ESMP.
- The financing partner will mount periodic supervision missions.

5.2 Effects Monitoring

Environmental effects monitoring is done to determine the environmental impacts that arise as a result of implementation of the project. In each aspect of the environment, indicators are determined and compliance is measured against those indicators.

Table 21 shows the different parameters to be used in each aspect of the environment.

Table 22: Monitoring Indicators

Area	Activity	Indicators	Monitoring Frequency	Estimated Costs (E)
Surface Water	Sampling and analysis of water quality for the Usuthu and other streams within the project area	Turbidity	Quarterly	18,000/6 months
		pH	Quarterly	
		Total dissolved Solids	Quarterly	
		Total Suspended Solids	Quarterly	
		Nitrates	Quarterly	
		Sulphates	Quarterly	
		Phosphates	Quarterly	
		Chemical Oxygen Demand	Quarterly	
		Metals	Every six months	
		Water usage data to be tracked to ensure sustainable water use	Volume of Water use (rate of water uptake).	
Installation of basic weather station (rainfall, temperatures)	Rainfall , temperatures	Weekly	1,000/month	
Ground water		Total dissolved Solids	Quarterly	18,000/6 months

Area	Activity	Indicators	Monitoring Frequency	Estimated Costs (E)
		Microbiological parameters (Total coliforms, E. Coli)	Quarterly	
		Total Suspended Solids	Quarterly	
		Nitrates	Quarterly	
		Sulphates	Quarterly	
		Phosphates	Quarterly	
		Chemical Oxygen Demand	Quarterly	
		Metals	Every 6 months	
Socio-Economic	Gender and Human rights impact monitoring	Number of women and disadvantaged groups with income.	Annually	10,000
	Public health: Determination of disease prevalence in project area health institutions.	Number of cases in each health facility.	Annually	10,000
	Social interactions	Number of project related conflicts	Annually	10,000
Ecology	Audit on AIS control	Extent of alien species invasion (ha coverage)	Every 2-3 years	20,000
	Effect on Management of green belts	Populations of flora and fauna in green belts)	Annually	10,000
TOTAL (annually)				130,000

5.3 Costs

The following table gives a summary of estimated costs associate with the ESMP.

Table 23: Summary Estimated Costs of ESMP Implementation

Component	Costs (E)
Implementation of mitigation measures	16,000,000
Monitoring	130,000/year
Resettlement	24,000,000 ³

³ This does not include compensation and relocation of graves, fields, kraals to be affected during the development of the irrigation blocks.

6. INSTITUTIONAL FRAMEWORK

6.1 Introduction

The institutional framework for the planning and implementation of LUSIP consists of the following categories of institutions:

1. Traditional Authority
2. Public sector institutions
3. Agricultural organizations and agribusinesses
4. Community-based/informal organizations

6.2 Traditional Authority

The most important political unit in the project area is the Chiefdom which constitutes the traditional authority (TA) structure. In rural Swaziland the chiefdom is the highest authority on Swazi Nation Land (SNL). Ultimately these hereditary chiefs are answerable only to the king with regards to chiefdom they govern. The chief has an *Indvuna* or headman and a *Bandlancane* or inner council to work with. These structures make up the Traditional Authority. The traditional authority allocates land, and settles disputes. In cases where the chief and/or his council are active, they also direct development activities within the community. For this reason the traditional authority is very important in establishing the legitimacy of a project, its acceptance in the community and its sustainability. Another important function of the local chief is the management and allocation of Swazi Nation Land.

In terms of interface between civil government's administrative structures, the 4 Regional Administrators work closely with all the chiefs in each of the regions and is therefore very influential. A Member of Parliament is chosen from each of the 55 constituencies or 'Tinkhundla'. As a rule each Inkhundla is made up of a number of chiefdoms depending on the size. At the Inkhundla level the council is called Bucopho Benkhundla.

The three chiefdoms in the LUSIP II project area are further divided into sections as shown below:

Table 24: Divisions within three Chiefdoms in the Project Area

Imiphakatsi (Chiefdom)	Tigodzi (Sections)	Inkhundla
Matsenjwa	Bbhobo; Hhungwane; Lushikishini; Ngonini; Sicelwini; Tinhlabeni	Nkilongo
Ngcamphalala	Goboyane; Ludlodlo; Mahlabaneni; Makhasane; Makhulusihlenge; Mayayeni; Mkhalamfene; Mcumaneni; Mdobandoba; Ncandweni; Ntamakuphila	Nkilongo
		Lubulini
Mngometulu	Gangakhulu; Lubulini; Mabantanini; Madabukeni; Matjetjeni; Moyeni; Ncandweni; Ndzevane; Ngonini; Victory	Lubulini

6.3 Chiefdom Development Plans

In September 2011, Matsenjwa Chiefdom completed and launched its CDP. Preparation of CDPs is in progress in the other two Chiefdoms⁴ and is expected to be completed during the first half of 2012.

CDPs contain physical and demographic characteristics of the chiefdom and a development strategy containing areas such as land use, agriculture and food security, infrastructure development, livestock management, environmental protection, public health, water and sanitation, education and related subjects.

The CDP process is both extensive and inclusive and involves the Chief, the Chiefdom Development Committee (CDC), Section Development Committee (SDCs), the Traditional Authority (TA), community volunteers and community members. Preparation of CDPs are considered to be the first step in building organizational capacity to plan, implement and manage the improvements provided by the Project. It is noted that awareness and participation in Matsenjwa Chiefdom is significantly higher than in the other two Chiefdoms who have yet to complete their CDPs. It is reported that CDPs in the other chiefdoms will not be completed until the first half of 2012.

In September 2011, the Matsenjwa Chiefdom completed and launched its CDP, while the Ngcamphalala Chiefdom launched its CDP in August 2012. Preparation of CDP is in progress in the Mngometulu Chiefdom.

CDPs contain physical and demographic characteristics of the chiefdom and a development strategy containing areas such as land use, agriculture and food security, infrastructure development, livestock management, environmental protection, public health, water and sanitation, education and related subjects.

4 A CDP facilitated by SWADE was prepared for the part of Ngcamphalala Chiefdom included in LUSIP Phase I in 2009.

The CDP process is both extensive and inclusive and involves the Chief, the Chiefdom Development Committee (CDC), Section Development Committee (SDCs), the Traditional Authority (TA), community volunteers and community members. Preparation of CDPs are considered to be the first step in building organizational capacity to plan, implement and manage the improvements provided by the Project. It is noted that awareness and participation in Matsenjwa Chiefdom is significantly higher than in the other two Chiefdoms who have yet to complete their CDPs. It is reported that CDPs in the other two chiefdoms will not be completed until 2012.

6.4 Public sector institutions

The public sector institutions which are most relevant to the implementation of LUSIP are the Swaziland Water and Agricultural Development Enterprise (SWADE), the Department of Water Affairs (DWA) and the Swaziland Environment Authority. The role and functions of these organizations are described in more detail below.

6.5 Swaziland Water and Agricultural Development Enterprise (SWADE)

SWADE is a Government-owned company and is controlled and monitored as a Public Enterprise under the Public Enterprise (Control & Monitoring Act, 1989). SWADE operates under a Board of Directors, which is responsible for the overall planning and policy direction. SWADE currently operates under the auspices of the Ministry of Agriculture, and is the implementing agency for LUSIP. SWADE currently has project and staff offices in Siphofaneni and a project office for LUSIP Phase II located at Big Bend.

The project office in Big Bend presently has five community development (CD) staff with responsibilities for community planning, agro-business development, environment, resettlement and gender. SWADE CD staff has been working with the communities in the project area and has actively participated in the preparation of this feasibility study. SWADE community development staff has worked with communities in LUSIP Phase I since 2006 and with the three chiefdoms in LUSIP II since 2010 to prepare Chiefdom Development Plans (CDPs).

6.6 Department of Water Affairs (DWA)

The Department of Water Affairs, under the Ministry of Natural Resources and Energy is responsible for the exploration, exploitation, management and protection of the country's water resources. The Rural Water Supply Branch (RWSB) of DWA was established to address the issue of potable water supply in rural areas. RWSB's regional office for Lubombo is located in Siteki and is mandated to design and supervise construction of piped schemes in rural areas, install hand pumps, train and advise water committees, and monitor the functioning of completed facilities. However, due to resource constraints and shortage of staff and transportation, presently RWSDB cannot effectively discharge all of its duties.

Siting, drilling and pump testing of boreholes for rural water supplies are undertaken by the Hydrogeology and Drilling Section of DWA located in Matsapha. Water quality testing and monitoring is carried out by the Laboratory Section of DWA located in Mbabane.

The DWA is also mandated to implement the provisions of the Water Act 2003, which include the formation of a new institutional framework for the water sector in Swaziland. The Act includes provisions for establishing a national water authority with one representative nominated by the Swaziland Sugar Association, five new river basin authorities, including the Usuthu River Basin Authority, Water User Associations and Water User Groups. The Act also contains provisions for existing Irrigation Districts to become incorporated and are presently known as Water User Districts.

6.7 Swaziland Environment Authority

The main objective of the Swaziland Environment Authority is to ensure that the environment in the Kingdom of Swaziland is treated in a proper way now and in the future. Its forms, land, soil and subsoil, flora, fauna, energy sources, mineral, topographical formations with energy potential, geothermal resources, living resources, landscape resources and other elements, and factors such as residues, garbage, waste and refuse, noise, living conditions in human settlements, and man-made products. SEA controls that the environment is treated properly and monitors the development in the state of the environment. The SEA is based in Mbabane.

The functions of SEA as stipulated in the Environmental Management Act 2002 are to provide for and promote the protection, conservation and enhancement of the environment and the sustainable management of natural resources.

The SEA is mandated to enforce, among others, the Environmental Audit, Assessment and Review Regulations, 2000. The objective of these Regulations is to avoid and mitigate adverse effects of proposed projects and existing undertakings. It provides a method of certifying project proponents who comply with both preliminary procedures for their activities. It also arms the Authority with legal sanctions in times of non compliance. It is the only piece of legislation that provides for public participation in environmental matters.

The SEA is also responsible for enforcing the Water Pollution Regulations, 2001, which include water quality objectives, effluent standards, testing and monitoring protocols and enforcement of mitigation measures.

6.8 Agricultural organizations and agribusinesses

An important set of institutions in the PDA are the various agricultural membership and agribusiness organizations which serve as a link between individual farmers and broader markets. Membership organizations include, but are not limited to, Farmer's Associations (FAs), Agricultural Cooperatives (ACs), Communal Garden Associations, etc. There is currently an effort in progress by SWADE in the PDA to establish new agribusinesses and to convert existing FAs and ACs to agribusinesses.

Farmer's associations and cooperatives are common in the LUSIP II PDA and mostly concentrate on irrigated sugar cane cultivation. SWADE is supporting a number of Farmer Associations (FAs) in the LUSIP PDA through advice, training and management support and is promoting the creation of new agribusinesses.

FAs were usually formed in a lengthy process within the area of single chiefdoms with the support of the chief as well as the community involved. The FA would then be provided with land rights to Swazi Nation Land (SNL), which before was either idle or would be formed in a restructuring exercise involving typically the entire community (in rare cases, the FA leased non-SNL areas). Funding for investments for the irrigation infrastructure was originally made available via three Development Financing Institutions (DFIs) and one commercial bank. Due to government support, FAs were able to almost completely finance their investment and operational requirements with loans, provided at or below commercial rates.

FAs are in most cases formally companies that have either developed from associations or were created anew. FAs can be registered as an association under the Swaziland Companies Act of 1912 or as a cooperative under the Cooperatives Societies Proclamation 1964. Under Swazi law associations have a difficult ownership and liability structure for the Development Financing Institutions (DFIs), thus making the financing institutions push the FAs to register as a company.

FAs are typically governed by an elected managing board with an elected or appointed manager responsible for the day-to-day operation of the FA. The manager is typically assisted by other salaried employees such as a secretary, accountant/bookkeeper, technical supervisor and others depending on the size and activities of the FA.

Members' contributions to the FA are mainly in the form of land use claims. As almost all FAs are located on Swazi Nation Land, the actual land title cannot be transferred to individuals or companies. Instead, the traditional authority (local chief and his council, or the King himself) agrees to provide an area of land for a period of 99 years to the scheme. Depending on the situation before initiation of the scheme, the land was either vacant, used for grazing, or redistributed in a community effort to allow for the formation of the FA. In addition, members are required to purchase shares in the FA, with usually a prescribed or informal limit of one share per member. Profit distribution (dividends) is typically foreseen as equal among the members.

6.9 Community-based Organizations (CBOs)

At community level there is a dense network of active groups and organizations in the PDA, which includes Rural Health Motivators (RHMs), Home-Based Caregivers (HBC), and Neighborhood Care Points (NCP), parent-teacher associations, churches and religious organizations representing various denominations, as well as kindergartens and pre-schools run by individuals or religious organizations which can serve as entry points for community activities and projects.

An example of the types of and membership in community-based organizations in the project area can be seen in the results of a study in the Ngcamphalala Chiefdom as shown in the following table:

Table 25: Types and Membership of Community Based Organization in the Project Area

Local Institution	Total	%
Traditional Authority Structure	15	6.8
Tinkhundla	0	0.0
Farmers' Association	32	14.6
Co-operative	4	1.8
Development Committee	5	2.3
Livestock/Grazing Association	0	0.0
Communal Gardening Group	1	0.5
Community Police	11	5.0
Church group	64	29.2
Church Committee	20	9.1
School Committee	9	4.1
Burial Society	2	0.9
Holisana	9	4.1
Women's Group	6	2.7
Garden	6	2.7
Care Group	5	2.3
Craft group	1	0.5
Other 1	3	1.4

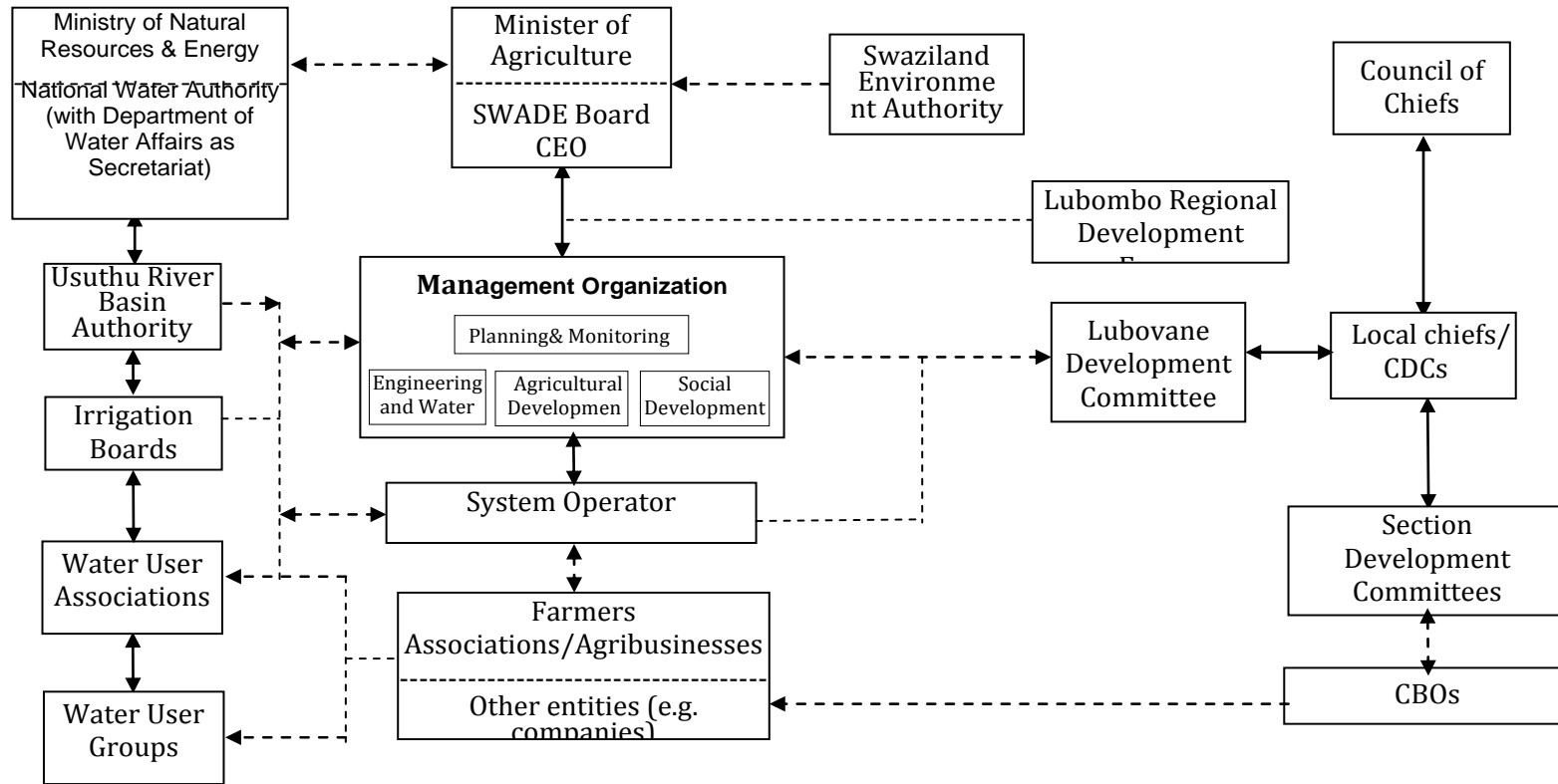
Source: Census and Socio-economic Survey Report, Lower Usuthu Smallholder Irrigation Project, SWADE, 2006

As can be seen from the above table, the most common affiliations are with religious organizations, followed by farmers' associations and the traditional authority structure. These organizations represent significant social capital that should be mobilized in support of future development activities, including LUSIP. Both men and women are active in these organizations, while there is a tendency for men to be more active in managing irrigation systems, and women more active in activities concerning nutrition, health care, education and domestic drinking water. Women are also found to be very active in forming and managing communal garden groups.

The Organoram below displays the relationships between key institutions in LUSIP:

Diagram: Organogram showing interrelationships between key organizations in LUSIP.

Indicative Post-Project Institutional Scenario



Legend		
— Formal relationship - - - Informal relationship	CBO Community Based Organization CEO Chief Executive Officer	CDC Chiefdom Development Committee

Lower Usuthu Small
Analysis – Detailed Design

Economic



7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Strategic Environment Assessment

There is a need for the Swaziland Government to conduct a Strategic Environment Assessment on Agricultural development in the country. This needs to be done to ensure that as agricultural development is planned in the country, this is done in line with other competing land uses, and taking into account food security issues. This would also ensure that natural flora and fauna are not lost, as a mapping of biodiversity rich areas would be preserved and conservation related income generation activities are also implemented.

7.2 Crop Diversity and access to food

With the challenges of climate change, which impacts on crop water requirements, there is a need to investigate the commercialization of other crops, which may also be mixed with the sugarcane, while gradually finding new channels of commercialization of other crops. This way, adaptation to the effects of climate change would be easier as there would be other options that had been tried over time. Another threat that needs to be addressed is the issue of sugar prices, which may affect the profitability of sugar cane farming if there is an increase in global sugar supply.

7.3 Livestock management

Livestock commercialisation also requires policy initiatives that would make the livestock industry to be attractive in terms of prices and initiatives to control existing overstocking problems.

7.4 Training

The sustainability of the commercial farming in the community is highly dependent on the level of preparation and training of the farmers on business management, forming farmers associations, conflict resolutions, and cost management. In addition there is a need for training farmers on environmental management in the farms.

7.5 Climate change and Water Conservation and Demand Management

There is a need for a climate change national framework as it is difficult to implement/plan for adaptation. Sugarcane will be less vulnerable to climate change due to irrigation but the predicted reduction in precipitation and increased temperatures will affect the crop.

7.6 Finance and Funding

Considering the fact that the farms are developed under 100% loans from banks, it is important that the current funding mechanism is revised to be able to realise the intended objective of poverty alleviation and for the sustainability of these farms. The Government can look into other options such as grants or loans at lower interest rates. The above situation suggests that there is a strong and urgent need for financial restructuring of both seasonal loans and capital investment loans. Financial restructuring of existing loans is essential, since without it smallholder farmers will see no personal benefit from the implementation of measures to improve yields, increase sucrose content and reduce seasonal costs.

7.7 Poverty alleviation

Such a picture indicates that development should not just be viewed as a matter of growth in per capita income since it is possible to record a high growth rate in per capita income while the masses of the people continue to be in abject poverty and lacking in the basic necessities of life. An important objective of the projects and programmes therefore must be to spread the benefits of economic development such that the Swazi farmers experience a marked improvement in their standard of living.

7.8 Operational Phase Farmer's Environmental Management

After the formation of the farmer associations, it is critical for each farmer association to develop its Comprehensive Mitigation Plan. This will be specific to the issues relevant to the environmental management of the association, and allocation of responsibilities in each organization's specific set up. SWADE should help facilitate this, as part of its training, so that issues of environmental management, health and safety are not left behind.