Restructuring and Diversification Management Unit (RDMU) to coordinate the implementation of the National Adaptation Strategy to the EU Sugar Reform, Swaziland

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Strategic Environmental Assessment of the NAS

Study Report – August 2010

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Study Report

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List of Acronyms and Abbreviations

€	Euro
AAP	Annual Action Programme
ACAT	Africa Cooperative Action Trust
ACP	Africa Caribbean Pacific
ADP	Area Development Programme
AEZ	Agro-Ecological Zone
AIDS	Acquired Immune-Deficiency Syndrome
AMICAALL	Africa Mayors' Initiative for Community Action on AIDS at the Local Level
AMS	AIDS Management System
AMSP	Accompanying Measures for Sugar Protocol Countries
ART	Antiretroviral Therapy
ARV	Anti-Retroviral
BCH	Burnt Cane Harvesting
BCHA	Business Community and HIV/AIDS
BCPD	Biodiversity Conservation Development Project
BMA	Biodiversity Management Authority
BOD	Biological Oxygen Demand
BSAP	Biodiversity Strategy and Action Plan
C	Carbon
CAADP	Comprehensive Africa Agriculture Development Programme
CANGO	Coordinating Assembly of Non Government Organisations
CASP	Comprehensive Agricultural Sector Policy
CBA	Cost-Benefit Analysis
CBD	United Nations Convention on Biological Diversity
CBO	Community Based Organisation
CCM	Country Coordinating Mechanism
CDM	Clean Development Mechanism
CEP	Country Environmental Profile
CMAC	Conciliation, Mediation and Arbitration Commission
CMP	Comprehensive Management Plan
CMS	Concentrated Molasses Solids
CO	Carbon monoxide
CO_2	Carbon dioxide
COD	Chemical Oxygen Demand

COMESA	Common Market for Eastern and Southern Africa
CSO	Central Statistical Office
CSP	Country Strategy Paper
DAC	Development Assistance Committee
DFI	Development Finance Institution
DO	Dissolved Oxygen
DWA	Department of Water Affairs
DWL	Dam Wall Length
E	Emalangeni
EAP	Employee Assistance Programme
EBA	Everything But Arms
EC	European Commission
ECAM	European Commission Accompanying Measures
EDF	European Development Fund
EIA	Environmental Impact Assessment
EM	Extraneous Matter
ETS	Emalangeni per tonne sucrose
EU	European Union
FA	Farmers' Association
FAO	Food and Agriculture Organisation of the United Nations
FAWESWA	Forum for African Women Educationalists Swaziland Chapter
FINCORP	Swaziland Development Finance Corporation
FLAS	Family Life Association of Swaziland
FLO	Fair Trade Labelling Organizations International
FSL	Full Supply Level
GCH	Green Cane Harvesting
GCM	Global Climatic Model
GCU	Gender Coordination Unit
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoS	Government of Swaziland
GSC	Gross Storage Capacity
HAPAC	HIV/AIDS Prevention and Care
HBC	Home-Based Care
HCB	Hexachlorobenzene
HDI	Human Development Index

HIV	Human Immunodeficiency Virus
HPI	Human Poverty Index
IAIA	International Association for Impact Assessment
ID	Irrigation District
IPCC	Inter-Governmental Panel on Climate Change
IPP	Independent Power Producer
ISO	International Organisation for Standardisation
ITF	Individual Tenure Farm
IWRM	Integrated Water Resources Management
JWC	Joint Water Commission
KDDP	Komati Downstream Development Project
KOBWA	Komati Basin Water Authority
KTM	Kill-to-Mill time
KVA	Kilo Volts Amps
LDC	Least Developed Country
LDS	Lutheran Development Services
LUSIP	Lower Usuthu Smallholder Irrigation Project
M+E	Monitoring and Evaluation
MAAS	Multi-Annual Adaptation Strategy
masl	Metres above sea level
MDG	Millennium Development Goal
MEE	Ministry of Enterprise and Employment
MEPD	Ministry of Economic Planning and Development
MIDC	Malkerns Irrigation Development Company
MIP	Multi-Annual Indicative Programme
MNRE	Ministry of Natural Resources and Energy
MOA	Ministry of Agriculture
MoH	Ministry of Health
MoHUD	Ministry of Housing and Urban Development
MTEA	Ministry of Tourism and Environmental Affairs
N	Nitrogen
NACSA	National Advisory Committee on Substance Abuse
NAS	National Adaptation Strategy
NBSAP	National Biodiversity Strategy and Action Plan
NDS	National Development Strategy
NEPAD	New Partnership for Africa's Development

NEPIS	National Energy Policy Implementation Strategy
NERCHA	National Emergency Response Council on HIV and AIDS
NGO	Non Governmental Organisation
NIP	National Implementation Plan
NLP	National Land Policy
NMSF	National Multisectorial Strategic Framework
NNC	National Nutrition Council
NO_2	Nitrogen dioxide
NO_2^-	Nitrites
NO_3^-	Nitrates
NPDP	National Physical Development Plan
NRB	National Resources Board
NRRP	National Rural Resettlement Policy
NRSE	New and Renewable Sources of Energy
NSC	Net Storage Capacity
NSP	National Multisectorial Strategic Plan
NWA	National Water Authority
NWP	National Water Policy
O_3	Ozone
OECD	Organisation for Economic Cooperation and Development
OVC	Orphans and Vulnerable Children
PCB	Polychlorinated biphenyls
PCDD	Polychlorinated dibenzo-p-dioxins
PCDF	Dibenzofurans
pH	Hydrogen Potential
PLWHA	People Living With HIV and AIDS
PM10	Particulate matter of 10 micrometers or less
PMTCT	Prevention of Mother-to-Child Transmission
PMU	Programme Management Unit
PO_4^-	Phosphates
POP	Persistent Organic Pollutant
PPA	Power Purchasing Agreement
PPP	Purchasing Power Parity
PRSAP	Poverty Reduction Strategy and Action Plan
PRTF	Poverty Reduction Task Force
PRU	Poverty Reduction Unit

PSI	Population Services International
RBA	River Basin Authority
RDMU	Restructuring and Diversification Management Unit
REASWA	Renewable Energy Association of Swaziland
RMF	Ratoon Management Fund
RPDP	Regional Physical Development Plan
RSA	Republic of South Africa
RSSC	Royal Swaziland Sugar Corporation
S	Sulphur
S&M	Small and Medium
SACU	Southern African Customs Union
SANS	South African National Standard
SAPWU	Swaziland Agricultural and Plantation Workers Union
SAR	Sodium Absorption Ratio
SASO	Swaziland AIDS Support Organisation
SC	Steering Committee
SCB	Swaziland Citrus Board
SCCI	Swaziland Chamber of Commerce and Industry
SCCP	Swaziland Climate Change Programme
SCG	Small Cane Growers
SCGA	Swaziland Cane Growers Association
SCORE	Select Committee on Rural Electrification
SD	Swaziland
SDHS	Swaziland Demographic and Health Survey
SEA	Swaziland Environment Authority
SEA	Strategic Environmental Assessment (international acronym)
SEAP	Swaziland Environmental Action Plan
SEB	Swaziland Electricity Board
SEC	Swaziland Electricity Company
SEDCO	Swaziland Enterprise Development Company
SFDF	Swaziland Farmers Development Foundation
SHAPE	Schools Health and Population Education
SHIES	Swaziland Household Income and Expenditure Survey
SHIP	Small-Holder Irrigation Project
SIS	Sugar Industry Strategy
SME	Small and Medium Enterprise

SMS	Swaziland Meteorological Service
SNAP	Swaziland National AIDS Programme
SNL	Swazi Nation Land
SNTC	Swaziland National Trust Commission
SO	Specific Objective
SO_2	Sulphur dioxide
SPS	Sanitary and Phytosanitary
SS	Suspended Solids
SSA	Swaziland Sugar Association
SSG	Small Scale Grower
SSMA	Swaziland Sugar Millers Association
STI	Sexually Transmitted Infection
StrEA	Strategic Environmental Assessment (Swazi acronym to avoid confusion with the Swaziland Environment Authority)
SWADE	Swaziland Water and Agriculture Development Enterprise
SWANNEPHA	Swaziland National Network of People Living with HIV and AIDS
SWAPOL	Swaziland Positive Living for Life
SWOT	Strengths-Weaknesses-Opportunities-Threats
TASC	The AIDS Information and Support Centre
TB	Tuberculosis
TC	Tonnes of cane
TDCA	Trade, Development and Cooperation Agreement
TDL	Title Deed Land
TDS	Total Dissolved Solids
TEF	Toxic Equivalent Factor
TEQ	Toxic Equivalent Quantity
THO	Traditional Healers Organisation
ToR	Terms of Reference
TPTC	Tripartite Permanent Technical Commission
UN	United Nations
UNAIDS	United Nations Joint Programme on HIV/AIDS
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNCTAD	United Nations Conference on Trade and Development
UNDF	United Nations Development Framework
UNDP	United Nations Development Programme

UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
UNISWA	University of Swaziland
US	United States of America
US$	United States Dollars
VAC	Vulnerability Assessment Committee
VCT	Voluntary Counselling and Testing
WFP	World Food Programme
WFS	World Food Summit
WHO	World Health Organisation
WRMP	Water Resources Master Plan
WUA	Water Users' Association

List of Units Used

º	Degrees
‘	Minutes (latitude/longitude)
%	Percentage
ºC	Degree Celsius
µg	Microgramme
a	Annum
gTEQ	Grammes of Toxic Equivalent Quantity
GWh	Gigawatt-hour
h	Hour
ha	Hectares
km	Kilometre
km^2	Squared kilometre
KWh	Kilowatt-hour
l	Litre
m	Meter
m^3	Cubic meter
mm	Millimetre
Mm^3	Million cubic metres
s	Second
t	Tonne
TEQ	Toxic Equivalent Quantity
yr	Year

1 EXECUTIVE SUMMARY

Swaziland has benefited from the European Union (EU)/Africa Caribbean Pacific (ACP) Sugar Protocol, allowing it to export a quota of sugar to the EU market at a preferential price. In 2006, the EU common organisation of the markets in the sugar sector was reformed. This reform involved a reduction of the EU sugar prices by 36% by 2009, which is reflected in the price obtained by ACP Sugar Protocol countries. As a consequence, the EU denounced the Sugar Protocol with effect from 1/10/2009. The European Commission (EC) has proposed an assistance scheme to help the Sugar Protocol countries who depend on the EU market, to adapt to the new situation.

In this context, the EC has provided support to Swaziland in implementing the National Adaptation Strategy (NAS) through its Multi-Annual Indicative Programme (MIP) for the Accompanying Measures for Sugar Protocol Countries (AMSP).

The NAS is divided into eight areas, under which 60 measures are proposed. The eight areas of development are:

1. Competitiveness of the sugar industry
2. Trade policy and the pursuit of premium markets
3. Promoting productivity and efficiency in smallholder cane growing
4. Diversification within and outside the sugar industry
5. Social services, welfare and labour issues
6. Mitigating impact on the government's fiscal position
7. Enhancing a sustainable socio-economic environment and cross-cutting issues
8. Institutional structures for implementation

The Multi-Annual Adaptation Strategy (MAAS) is the EC's Response Strategy to the NAS. Since EC support would not be sufficient to fund the whole of the NAS, the selection of measures to be supported was based on priorities and the competitive advantages of the interventions. In the current MIP 2007 – 2010 the EC intervention covers the following areas:

– Institutional support, including the establishment of the Restructuring and Diversification Management Unit (RDMU) for NAS implementation, and a pool of experts to provide expertise in all relevant areas;

- Restructuring the provision of social services;
- Support for improving the productivity and efficiency of smallholder sugar cane growers to ensure their long-term viability including co-funding of the Lower Usuthu Smallholder Irrigation Project (LUSIP) programme where funding gaps arise;
- Infrastructure improvements in the production centres, the sugar estates and the transport chain; and
- Support for diversification in the form of alternative agricultural products (cane based or others) and non-agricultural uses.

As the implementation of the NAS may have impacts on the environment, the EC and the Government of Swaziland (GoS) have foreseen to carry out a Strategic Environmental

Assessment (StrEA[1]) which will provide recommendations both to the EC and the GoS on how to enhance the environmental performance of the NAS. Inclusion of sustainable environmental measures within the NAS is generally missing and the recommendations emanating from this StrEA have required the inclusion of other state and non-state actors for implementation. The implementation of the NAS touches in varying degrees on the environment (biodiversity, land degradation, water quality, habitats, etc) and it is critically important that NAS implementers endeavour to include broader participation of the Swaziland Environment Authority and other environmental actors into its programme of work.

The first part of the StrEA was the Scoping Study, where key aspects were identified. These were subsequently validated and adapted accordingly through a stakeholders' workshop. Key aspects are categorised as High-, Medium- and Low-priority.

The StrEA Study assessed the key aspects in further detail. An environmental baseline was established; potential impacts were identified and assessed, under the assumption of no implementation of the NAS ('zero alternative') and expected impacts with NAS implementation; and finally recommendations are made to address key aspects and optimise environmental performance of the NAS, including performance indicators.

The StrEA was based primarily on: a comprehensive literature review; bi-lateral and multi-lateral semi-structured interviews with key actors; a stakeholders' workshop using the 'world café' format; use of Leopold-type matrices and cause-effect diagrams; site visits; expert judgement; and a continuous communication with key stakeholders (e.g. consultations via telephone and email exchanges). Furthermore opportunities were given to stakeholders to have an input at key stages of the StrEA; and the scoping and StrEA Study reports were circulated to key stakeholders for comments.

It should be highlighted that the NAS was prepared in 2006. **The fact that the StrEA was not done concurrently with NAS preparation inevitably limits the potential to influence its contents. Nevertheless there are still opportunities to enhance the environmental performance of NAS implementation if the GoS and the EC have the willingness to study and integrate recommendations that this StrEA makes.**

High Priority Aspects

Key Aspect 1. Water availability / climate change

- Sugar cane is a water-intensive crop, and 100% of its cultivation in Swaziland depends on irrigation.
- Three main river basins feed most of the sugar cane farming areas: Usuthu, Mbuluzi and Komati. These are all transboundary water courses and the management of these river basins is regulated under international agreements between Swaziland, South Africa and Mozambique.
- Water availability is the main limiting factor for the expansion of sugar cane farming. The construction of irrigation schemes along the Usuthu (i.e. the Lower Usuthu Smallholder Irrigation Project - LUSIP) and the Komati (i.e. Maguga dam and Komati Downstream Development Project - KDDP) has increased water availability for sugar cane expansion through purpose built storage reservoirs.

1 The Acronym StrEA will be used throughout the document to designate the Strategic Environmental Assessment, and not the internationally accepted SEA, as in Swaziland the acronym SEA designates the Swaziland Environment Authority. The use of the acronym SEA to designate the Strategic Environmental Assessment is nevertheless retained for the title of the report, so it corresponds to the ToR and the common use of the acronym in the European Commission.

- In spite of the above water-storage schemes, there are indications that the water from the entire country's major rivers, including the Mbuluzi and the Komati rivers are over-allocated. In addition water availability in the Usuthu is increasingly becoming unreliable for farmers abstracting water directly from the river.
- Climate change is resulting in changes in rain patterns, temperature regimes and wind speeds, and is expected to result in reduced water availability. In addition increased abstractions from within the basins are also affecting water availability in the lower reaches of basins. Sugar cane farming developments to date have not been factoring in the predicted impacts of climate change, and measures to increase water availability (storage dams), are designed to be fully exploited, not as adaptation measure to climate change.
- A decrease in water availability may make sugar cane farming non-viable, and thus trigger a risk of land abandonment, with the environmental and socio-economic impacts that that implies (e.g. take-over by invasive species, decrease in food security and bad debts for the irrigation systems).
- Water allocations were until 2003 the responsibility of the Water Apportionment Board (under the 1967 Water Act), but these functions are to be taken over by the River Basin Authorities (RBAs) (formed under the 2003 Water Act). There seem to be information gaps with regards to water availability and modelling of water demand in the medium- and long-term, which would place serious restrictions on RBAs to adequately perform their mandated functions in the allocation of water rights.

Key Aspect 2. Long-term social and environmental sustainability of small-cane growers

- Smallholder developments established in LUSIP and KDDP are facing serious financial challenges, for example, not being able to pay back loans resulting in a lack of expected benefits. The NAS, through EU and GoS support, is working on interventions that could be implemented to alleviate this problem.
- Apart from the initial set-up costs being addressed by the NAS, the main running costs of sugar cane farms are energy and transport. The cost of electricity has recently increased 25%, and Swaziland's dependency on electricity from South Africa generates uncertainty around price stability. The price of transport fuel has also been increasing.
- Initial business plans for smallholder developments did not factor in projections for the increase in the cost of electricity and fuel costs in the medium- and long-term. However, new business plans make an attempt to address these potential increases.
- Equipment in use by smallholder growers is allegedly energy-inefficient, adding to the electricity costs. Many smallholder growers have not taken up "time of use" tariffs offered by the Swaziland Electricity Company (SEC) to optimise their energy usage during off-peak periods.
- There is a high risk that sugar cane farming becomes financially non-viable, aggravated by the risk of water scarcity derived from the effects of climate change (as expressed under Key Aspect 1 above).
- Although various training and extension support is provided to growers in the sugar industry by the Millers, SWADE, Ministry of Agriculture (MOA) and other institutions, the management and capacity of farming bodies, such as Farmer/Water User Associations has not yet been addressed and is of concern for long-term sustainability.
- Extensive and expensive infrastructure has been installed to support smallholder irrigation projects, and requires maintenance by local users. Optimal upkeep of the

irrigation infrastructure is important to maintain distribution and application efficiencies but is costly.

Key Aspect 3. Loss of biodiversity due to land-take for sugar cane expansion

- Many of the lands where sugar cane cultivation is taking place were previously natural bush; in a specific case land was exchanged from the Hlane National Park to accommodate an RSSC expansion need.
- Natural vegetation keeps being removed for sugar cane expansion associated with the LUSIP and KDDP schemes thus disrupting natural ecosystem functions and services.
- Pressure is increasing on areas of high biological diversity for conversion to agriculture, and to irrigated sugar in particular. Long term environmental benefits and services are being forfeited most likely for short term economic benefits. Increased availability of water for expansion purposes will increase the threat to areas of high biological diversity.
- Although EIAs are carried out for specific irrigated cane developments, no systematic assessment of cumulative impacts has taken place. The environmental implications of this are aggravated by the absence of effective protection of biodiversity (e.g. network of protected areas with representation of native, threatened and endangered species).

Key Aspect 4. Risk of HIV/AIDS associated with the sugar cane industry, particularly in relation to smallholder irrigation schemes

- Swaziland has reportedly high incidences of HIV/AIDS prevalence and infection.
- With any new development there is an increase in the risk of HIV/AIDS, with the in-migration of outsiders into the area to seek or take-up work opportunities.
- HIV/AIDS is having an impact on productivity in the sugar industry, with trained personnel having to leave their jobs, and workers taking time off sick or unable to perform some of the more active tasks associated with the work (e.g. cane cutting). There is also a decrease in the number of potential labourers, for sugar cane growing companies (e.g. Ubombo Sugar and Royal Swazi Sugar Corporation - RSSC) and for the smallholder schemes.

Medium Priority Aspects

Key Aspect 5. Emission of Persistent Organic Pollutants (POPs) from sugar cane burning and socio-economic implications of green cane harvesting

- Swaziland has ratified the Stockholm Convention on Persistent Organic Pollutants (POPs). It is currently in the process of preparing its National Implementation Plan (NIP) for the Stockholm Convention.
- One of the sources of unintended generation of POPs is the open air burning of biomass, including sugar cane burning. Cane burning is the second main source of emission of POPs in Swaziland, with 7.9% of total emissions (the main source is open air burning of domestic rubbish).
- The NIP will include measures to address a reduction in cane burning.
- Burnt cane harvesting (BCH) has some advantages for the farmers, related mainly to speed of manual cane cutting and intensity of labour. BCH may also have disadvantages beyond the emission of POPs, including those related to the quality of the cane (due to dextrose formation and the need to bring the cane to the mill quicker

to keep the same quality), destruction of micro-fauna and soil quality. Green Cane Harvesting (GCH) offers other advantages, such as the availability of tops and trash that may be used for mulching and co-generation.

- Although the sugar mill estates are shifting to GCH, smallholder schemes and commercial farmers will most likely continue to burn cane.
- Land under BCH is expanding under the LUSIP and KDDP schemes.
- Addressing cane burning must address socio-economic aspects, such as: employment (job opportunities are reduced if mechanised harvesting is introduced) and income (GCH is more labour-intensive, and tops and trash have an economic value to the mill which should be paid to the farmer).

Key Aspect 6. Water pollution from agricultural run-off / monitoring of water quality

- Water pollution from agricultural run-off has not been a concern for the relevant key regulatory authorities, although it is likely to be an important contributing factor to poor surface water quality.
- The degree of water quality monitoring is currently uncertain and information gaps seem to exist.
- The expansion of sugar cane farming, especially by smallholder growers who are new to the activity, implies a risk of inadequate management of agrochemical products, and also an inherent risk of increasing water pollution from non-point sources (agricultural run-off).
- New structures should be in place based on the Water Act, wherein the River Basin Authorities are taking over functions of water quality monitoring. These structures are yet to be implemented.

Low Priority Aspects

Key Aspect 7. Regulation of effluent discharges

- The regulation of effluent discharges has been handed over to the River Basin Authorities, based on the Water Act. Effluent discharge standards are regulated by the Water Pollution Control Regulations of 2010 (under the Environmental Management Act). Up to now effluent discharges have not been closely monitored in Swaziland and there is potential confusion on the provisions for effluent control defined in the Water Act and in the Water Pollution Control Regulations.
- Contribution to surface water pollution by effluent discharges from the sugar industry (including fields, mills and distilleries) is unknown due to lack of monitoring.

Key Aspect 8. Regulation of atmospheric emissions

- Atmospheric emissions have not been regulated in Swaziland. Recently Atmospheric Pollution Control Regulations (2010) have been gazetted, but these do not establish emission limits. The list of control parameters is also ambiguously defined, and thus of difficult implementation.
- Although atmospheric emissions and air quality are not a major environmental concern in Swaziland, emissions should conform to international standards. In addition, if the emission of POPs is to be reduced through an increase in GCH, standards must be in place to ensure that those POPs are controlled before their release from stacks.

Recommendations

Addressing high-priority aspects

Climate change

- The National Climate Change Office, Swaziland Meteorological Service, National Water Authority, Department of Water Affairs, River Basin Authorities, along with bulk water users, relevant government departments, sections and ministries, and the scientific community responsible for climate change planning, must develop a strategy to adapt to the impact of climate change notably on water resources within the sugar sector, and be reflected in basin-wide water management planning.
- The Strategy:
    - Must establish the scale, significance and economic impact of climate change induced impacts on water resources through technical and scientific studies;
    - Must develop, collate and collect relevant baseline information to inform the strategy;
    - Must identify the spatial and temporal impacts of climate change on irrigation water requirements and yields for sugar cane;
    - Must assess any beneficial effects of climate change on yield due to increased CO_2 concentrations that might offset the potentially negative impacts of increased irrigation needs;
    - Must identify realistic and achievable adaptation measures to be implemented by the sugar sector that may include improvements in irrigation water management practices (e.g. irrigation scheduling and improvements in irrigation efficiencies);
    - Must include a situational analysis of the institutional capacity of River Basin Authorities and other related structures to implement their mandate as described in the Water Act, 2003;
    - Must be discussed and agreed with all key stakeholders;
    - Must include quantified objectives and time-bound targets;
    - Must define responsibilities; and
    - Must include a mechanism to report implementation and achievement of targets and objectives, on a regular basis.

Water availability

- The National Water Authority, Department of Water Affairs, River Basin Authorities, bulk water users, and national authorities and the water management community responsible for water resource planning, must develop a strategy to address shortcomings in national water management and be reflected in a water management and use strategy to improve sector wide irrigation efficiencies and strengthen RBA capacity.
- The Strategy:
    - Must address the shortfall in technical and financial capacity of RBAs to enable the RBAs to execute their mandated responsibilities;

- Must be based on a basin-wide hydrological assessment of the water balance for the Komati, Mbuluzi, Usuthu and Ngwavuma river basins;
- Must propose measures to be taken up by irrigators to improve their overall water use efficiencies by moving from surface methods of irrigation to more efficient sprinkler, centre pivot and drip systems;
- Must include recommendations on how to improve water governance at basin level; and
- Must include a sugar sector water footprint assessment (direct and operational footprint).

Long-term social and environmental sustainability of small-cane growers

- To evaluate the management models for small cane growers currently promoted by developers (e.g. Millers and SWADE) and the Swaziland Sugar Association (SSA). An evaluation would comprise a SWOT analysis of current models, and comparing the models with other options (such as co-operatives). Particular consideration need be given to the feasibility of outsourcing the management of Farmers' Associations (FAs), employing an outside private company to manage all the FAs in one development, such as in LUSIP and KDDP, and thus taking direct management responsibility away from the farmers themselves.

  The evaluation process would involve intense public participation at all levels, and particularly with the farmers themselves. It would require a supplementary education process, to ensure that the different options are presented before informed decisions are made.

- To strengthen the capacity building and training of farmers, particularly in skills relating to the entire managing of farms, individually and as part of a FA. One body needs to be designated the task of monitoring training across-the-board in the process ensuring that the training offered is appropriate to the requirements of farmers, is of a high level, is standardised across the country, and is being implemented, reaching all those in need.
- In order to address concerns around a 'safety net', to ensure social safeguards against potential failure of sugar cane farming through allocating portions of land to alternative viable crops and livestock farming.
- To undertake a cost-benefit analysis of the socio-economic impacts of increased mechanisation on the sugar industry, particularly the potential change in the current cost structure and the ultimate net return for the grower and income. Mechanisation will have both positive and negative effects; it may reduce labour requirements (thus indirectly related to HIV/AIDS) and labour costs, yet result in higher investment in equipment and energy costs, and cause the loss of jobs and potentially increase levels of poverty. Research into mechanisation would thus link in with broader socio-economic impacts.
- In order to reduce energy costs, an energy efficiency audit for the small- and medium-scale growers should be undertaken to identify savings measures and equipment.

Loss of biodiversity

- The Swaziland Environment Authority (SEA) and the Swaziland National Trust Commission (SNTC), along with relevant stakeholders must develop a strategy to address the loss or degradation of biodiversity associated with an expanding sugar sector, the displacement of livestock and lack of compliance and monitoring for all sugar projects.

- The Strategy:
    - Must address the requirement for biodiversity impact assessments and guidelines for such;
    - Must identify areas of high biological diversity and include the protection and management of such identified areas;
    - Must address the inadequate level of environmental compliance and monitoring of approved environmental assessment reports;
    - Must address the inadequate level of inclusion of livestock issues in pre- and post-development and develop clear guidelines on developing livestock impact assessment;
    - Must be discussed and agreed with all key stakeholders;
    - Must include quantified objectives and time-bound targets;
    - Must define responsibilities; and
    - Must include a mechanism to report implementation and achievement of targets and objectives, on a regular basis.

HIV/AIDS

- To undertake national studies focusing on the impact of HIV/AIDS on the industry, integrating work already undertaken in the industry. This will include:
    - An analysis of the national policy, regulatory and institutional framework to address HIV/AIDS-related challenges in the sugar industry, and of what is being implemented on-the-ground;
    - An analysis to determine risk/trends as they relate to the sugar industry (utilising, e.g. statistical projections, Health Impact Assessments, research projects), including stakeholder response to the possibility of risk; and
    - An assessment of the effects of possible changes in the industry (e.g. reduction in smallholder cane supply, mechanisation) to reduce employment requirements and/or to alleviate the workload of those who are ill. In particular the latter should concentrate on a cost-benefit analysis of mechanisation as a mitigating factor to possible labour-related shortages, for the mills and cane growers.
- To invest in health services impacting on the sugar industry through allocating resources to the identification, prevention and management of HIV/AIDS, with emphasis on VCT to be able to assess the extent of the problem, and specifically in relation to small cane growers.

Addressing medium-priority aspects

Emission of POPs

- The Swaziland Environment Authority should prepare a National Implementation Plan (NIP) for the Stockholm Convention which includes a strategy to reduce sugar cane burning. This strategy:
    - Must be discussed and agreed together with the key stakeholders, including as a minimum: sugar mill estates, cane growers and cane cutters;

- Must address the socio-economic aspects of increasing green cane harvesting, mainly reduced employment if mechanised, and fair standard for payment if hand-cut;
- Must include quantified objectives and time-bound targets;
- Must define responsibilities;
- Must include a mechanism to report implementation and achievement of targets and objectives, on a regular basis.

Water pollution from agricultural run-off / monitoring of water quality

- A strategy must be in place to ensure the five **RBAs are fully operational** (with technical and financial capacity), including clear and time-bound targets (see Key Aspect 1 above on water availability/climate change).
- The **water quality monitoring system** must be reviewed and revised so that:
  - It is comprehensive. It covers the whole country.
  - It discriminates the different river basins and sub-basins, so those basins and sub-basins with especially poor water quality can be easily identified and monitored, and sources of pollution easier to identify.
  - It defines sampling points and methodologies in a strategic manner to monitor impacts from the main industrial, agricultural and domestic potential sources of pollution. In the case of sugar cane, sampling points must be placed before and after sugar cane farming areas, in order to be able to measure impacts from agricultural run-off.
  - **Parameters to monitor** are representative of likely pollutants. In the case of the sugar sector parameters must include: BOD, COD, suspended solids (SS), Total Dissolved Solids (TDS), dissolved oxygen (DO), temperature, pH, conductivity, nitrates (NO_3^-), nitrites (NO_2^-), phosphates (PO_4^-), and fluoride. Basic parameters should be monitored regularly, whilst other parameters (e.g. herbicides, pesticides) can be monitored on a longer-time basis (e.g. annually or bi-annually), initially targeting those most commonly used.
- **Water quality reports** should be systematically produced by the RBAs and put in the public domain (e.g. SEA website).
- In case water quality monitoring identifies issues associated to agricultural run-off from sugar cane fields, an adequate **response strategy** should be generated to identify the causes and reduce contamination to ensure compliance with water quality objectives.
- The setting up of the RBAs should take into account the **costs associated to the monitoring of water quality** according to the above recommendations (e.g. number of samples, sampling points, costs of sampling and analysis, cost of reporting).

Addressing low-priority aspects

Regulation of effluent discharges

- Measures should be taken by the DWA and the RBAs to ensure all three sugar mills are in possession of an **effluent control permit**, following a technical assessment of their effluent treatment facilities and practices.

- Measures should be taken by the SEA to ensure all three sugar mills submit their monthly and annual **effluent quality reports** according to the Water Pollution Control Regulations (2010) and in a manner and format approved by the SEA.
- The SEA should maintain that all effluents from the sugar mills, whether they are discharged directly to water courses, or indirectly by being used for irrigation, are monitored according to the provisions of the Water Pollution Control Regulations (2010).
- If **effluent control regulations** under the Water Act (2003) are to be developed, it must be ensured that these are linked to the provisions of the Water Pollution Control Regulations (2010):
    - There should be no duplication of effluent standards, retaining those defined in the Water Pollution Control Regulations.
    - There should be no duplication in obligations for monitoring of effluent quality. A single set of parameters should be monitored and reported.
    - Compliance or non-compliance with effluent standards should be given under a single decision, jointly taken between the SEA and the authority in charge of implementing the effluent control regulations, as agreed. Appropriate coordination mechanisms should be set up to that effect.

Regulation of atmospheric emissions

- The list of "controlled air pollutants" included in the Atmospheric Pollution Control Regulations (2010) (Schedule Two) should be amended to eliminate the ambiguous control parameter "any other potentially toxic compounds", which is unmanageable for regulatory purposes. Instead a provision should be put in place in the main text of the Regulations to the effect that the SEA may require other air pollutants to be monitored based on the nature of the operator's activities.
- The Swaziland Environment Authority should take measures to implement the Atmospheric Pollution Control Regulations (2010), including ensuring that sugar mills carry out the required monitoring.
- Based on the results of the monitoring of atmospheric emissions following implementation of the Air Pollution Control Regulations (2010), the SEA will be in a position to determine if more efficient stack pollution control systems are required.

Recommendations of a general nature

- The development of an **Environmental and Social Management Code of Practice** in the Sugar Sector should be promoted, to be prepared jointly by all key stakeholders. Implementation of the Code of Practice should be voluntary and in no way undermine the role of legislation or of the regulatory authorities. The Code of Practice should cover issues like environmental pollution, degradation and assessments.
- Efforts to achieve **Fair Trade** certification should be accelerated, as it provides a self-regulated system that helps achieve good environmental and social management practices in field operations.
- The **NAS Steering Committee** should include representation from the Swaziland Environment Authority, the Swaziland National Trust Commission, the National Climate Change Office, the National Water Authority and representatives from the River Basin Authorities (e.g. Chairs of the RBAs). This is necessary to ensure the environment is better integrated in all NAS matters.

- Optimal use should be made of this StrEA process and report:
    - This StrEA should be **distributed to <u>all</u> key stakeholders**, taking the original list of invitees to the Stakeholders' Workshop as an indication of key stakeholders.
    - This StrEA report should be made **publicly available** and published on the web sites of *at least* the Restructuring and Diversification Management Unit (RDMU) and the European Commission (Swaziland Delegation). It is also recommended that it be made available on the web sites of the Swaziland Sugar Association (SSA) and the Swaziland Environment Authority (SEA).
    - The EC and RDMU should ensure that the findings of this StrEA are properly **discussed in the NAS Steering Committee**, and decisions/commitments made on how its findings will be implemented. Decisions and commitments should be recorded.
- It is recommended to disseminate the findings of the StrEA through a **joint press release** (GoS – EC). This was done recently in Zambia, with an immediate reaction by journalists drawing further attention to the Study.
- It is recommended for the GoS and the EC to carry out a **review on the effectiveness of this StrEA process**; this could take place around 6 to 12 months after its completion. The review would respond to questions such as: (i) did the recommendations made in the StrEA get implemented? Why or why not?, and (ii) did the StrEA lead to better decisions from an environmental and socio-economic point of view?
    - The EC's environmental advisory services developed a framework for the evaluation of StrEA effectiveness (unofficial document), which could be used as a basis for the review assessment. There are other guidance documents available which could be used as reference (e.g. in the OECD DAC SEA Guidance[2]).
    - The results of the follow-up study should be used to draw lessons useful for the enhancement of the StrEA system in Swaziland, as well as for future StrEAs financed by the EC. Experiences could be shared in the region and internationally (e.g. at the IAIA – International Association for Impact Assessment – annual conference), also as a way to trigger discussions with experts in the area that could be useful for improvement. This would also raise visibility of GoS and EC efforts to effectively mainstream the environment in its policies, plans and programmes.

This StrEA seeks to enhance the environmental and socio-economic performance of the sugar sector in general, and the expected impacts derived from NAS implementation in particular. This requires actions at a strategic level.

The best way to enhance the environmental and socio-economic performance of the sector sometimes requires actions beyond those that can be addressed by the NAS, or even by institutions in the NAS Steering Committee.

Rather than limit recommendations to the narrow range of those actions that can be incorporated in the NAS document, this StrEA offers a wider range of options at a strategic level that would most effectively address the concerns in the sector.

2 OECD DAC - Organisation for Economic Cooperation and Development, Development Assistance Committee (2006) *Applying Strategic Environmental Assessment, Good practice guidance for development cooperation,* OECD: Paris.

However, this implies that the NAS Steering Committee – as a key body that seeks the overall improvement of the sugar sector – should engage in a policy dialogue with other relevant institutions (and the GoS in general) to facilitate the implementation of actions beyond its control.

2 BACKGROUND

2.1 The EU sugar reform

Swaziland has benefited from the European Union/ACP Sugar Protocol, allowing it to export a quota of sugar to the EU market at a preferential price. In 2006, the EU Common Organisation of the markets in the sugar sector was reformed. Main features of the reform are: (a) a significant reduction in the price of sugar (36%) over four years beginning 2006/07; (b) voluntary reduction in the production quota through a high-incentive restructuring scheme; (c) introduction of a decoupled payment for sugar beet producers; and (d) new quota system and simplified quota management to ensure market balance in each marketing year.

The reform involves a reduction of the EU sugar prices, reflected in the price obtained by ACP Sugar Protocol countries. The European Commission (EC) proposed a scheme to help Sugar Protocol countries that depend on the EU market to adapt to the new situation. From 1 October 2009, the Sugar Protocol has been denounced and LDC ACP countries benefiting from the 'Everything But Arms' (EBA) initiative will have access to the EU market. An automatic volume safeguard clause will also be applied to ACP non-LDCs, such as Swaziland, allowing for a substantial increase of export levels. In the case of Swaziland the adaptation strategy for the sugar sector is reflected in the **National Adaptation Strategy in response to the EU sugar sector reforms** (NAS), developed in 2006.

The EC's Response Strategy to the NAS is reflected in the form of the Multi-annual Adaptation Strategy (2006-2013), which is implemented according to the Multi-Annual Indicative Programmes (MIP) for Swaziland under the Accompanying Measures for Sugar Protocol Countries (AMSP) (currently 2007-2010 and 2011-2013 under preparation) and the corresponding Annual Action Programmes. The Sugar Reform Accompanying Measures come under Regulation (EC) No 1905/2006 of the European Parliament and of the Council.

The adaptation strategy aims to support the effective implementation of the NAS in response to the EU Sugar Sector Reforms in specific areas, selected on the basis of added value, eligibility under EC financing policies, EC development policy guidelines and comparative advantages. The EC Response Strategy is incorporated into the 10th EDF CSP.

As the implementation of the NAS may have impacts on the environment, the EC and the GoS have called for a Strategic Environmental Assessment (StrEA) with the following global objective: *"…to describe, identify and assess the likely significant impacts on the environment of the implementation of the country's NAS actions."* The StrEA will provide recommendations to the EC and the GoS on how to enhance the environmental performance of the NAS.

It should be highlighted that the NAS was prepared in 2006. **The fact that the StrEA was not done concurrently with NAS preparation inevitably limits the potential to influence its contents. Nevertheless there are still opportunities to enhance the environmental performance of NAS implementation if the GoS and the EC have the willingness to study and integrate recommendations that this StrEA makes.**

The sugar sector in Swaziland is described below.

2.2 The Swaziland National Adaptation Strategy (NAS)

The National Adaptation Strategy (NAS) is aimed at tackling the impacts expected from the EU sugar reforms, but also addresses existing concerns in the sector. These are approached by the identification of measures to mitigate and minimise impacts, and make best use of existing opportunities. The NAS provides an analysis and overview of the expected socio-economic impact of the EU reforms, which is the basis for the development of "strategy measures for national adaptation".

General impacts expected on the sector from the sugar reforms include: reduced government revenues from sugar levies; reduced competitiveness of the sugar companies; reduced income and financial viability of smallholders and commercial farmers, including risk of existing irrigation schemes LUSIP and KDDP; increased vulnerability of smallholders; loss of jobs in the sugar sector; and reduction of social services provided by the sugar companies, amongst others.

The NAS is divided into eight areas, under which 60 measures are proposed. The NAS structure and proposed measures are described in Annex 1. The eight areas of development are:

1. Competitiveness of the sugar industry
2. Trade policy and the pursuit of premium markets
3. Promoting productivity and efficiency in smallholder cane growing
4. Diversification within and outside the sugar industry
5. Social services, welfare and labour issues
6. Mitigating impact on the government's fiscal position
7. Enhancing a sustainable socio-economic environment and cross-cutting issues
8. Institutional structures for implementation

These areas cover a broad range of issues dealing with various sectors, such as trade, energy, infrastructure, social services, land tenure, health, education, environmental management, etc. Implementation of the NAS is coordinated by a NAS Steering Committee with inter-sectoral representation, and financing is expected from various sources, including donors, government and industry. The responses foreseen include measures to improve the competitiveness and productivity of the sector, minimise costs, guarantee social services, reduce vulnerability of smallholders, make best use of existing market opportunities, promote diversification into sugar- and non-sugar products, and overall improve the performance of the sector.

The NAS Steering Committee is chaired by the Ministry of Economic Planning and Development (MEPD), and has representation from the following institutions and stakeholders: RDMU; SWADE; sugar mills; Swaziland Agricultural and Plantation Workers Union (SAPWU); the Swaziland Cane Growers Association; EC; Swaziland Sugar Association (SSA); Ministry of Natural Resources and Energy; and Ministry of Agriculture (MOA).

The 60 NAS measures consist more of a long-list of desired actions; mainly those reflecting the sugar industry's perceived needs (based on the Sugar Industry Strategy - SIS), plus those added by the Government. There are a series of aspects that prevent the NAS from being a user-friendly document, and difficult to work within the context of this study: actions are not prioritised; some "actions" are ambiguously worded and could be interpreted in different ways; one of the main sources of funding is the EC, with some components that are

being implemented directly by the industry, meaning that many of the "actions" are not foreseen to be implemented.

For the purposes of this StrEA a focus was given on those actions perceived as priorities, taking into account: (i) actions supported under the EC's MIP (2006-2010); (ii) actions expected to be supported under the MIP II (2011-2013); (iii) priorities defined by the sugar industry for which resources are being allocated; (iv) interpretation of some of the ambiguous actions in the NAS based on the understanding of key actors (e.g. the SSA, EC, RDMU).

2.3 The EC Multi-Annual Adaptation Strategy

The Multi-Annual Adaptation Strategy (MAAS) is the EC's Response Strategy to the NAS. Since EC support would not be sufficient to fund the whole of the NAS, the selection of measures to be supported was based on priorities and the competitive advantages of the interventions.

EC intervention will cover the following areas:

- Institutional support, including the establishment of a Restructuring and Diversification Management Unit (RDMU) for NAS implementation, and a pool of experts to provide expertise in all relevant areas;
- Restructuring the provision of social services;
- Support for improving the productivity and efficiency of smallholder sugar cane growers to ensure their long-term viability including co-funding of the LUSIP programme where funding gaps arise;
- Infrastructure improvements in the production centres, the sugar estates and the transport chain;
- Support for diversification in the form of alternative agricultural products (cane based or others) and non-agricultural uses.

The selection and identification of activities to be supported is based on the following principles: (a) long-term sustainability; (b) budget availability, deployment and prioritisation; (c) financing complementarities; (d) the EC strategy for Swaziland; (e) the comprehensive (multi-sectored, multi-annual) approach; (f) lessons learnt from devolution and regionalisation, and the practicality of delivering assistance in a timely and adequate manner; (g) poverty focus, and response to broader socio-economic impacts; and (h) mode for delivering assistance.

Implementation of the MAAS takes place according to the Multi-Annual Indicative Programmes (MIP), the first one covering the period 2007-2010. Break down of the support is provided in the Annual Action Programmes (AAP). The MIP 2007-2010 sets out four Specific Objectives (SO):

- SO 1: To help improve sugar production and its viability by providing assistance to small-scale sugar cane growers;
- SO 2: To identify and make operational an alternative model for providing social services that were previously provided by the sugar industry;
- SO 3: To improve transport infrastructures from the production areas to the mills; and
- SO 4: To support economic diversification in the sugar cane growing areas through crops diversification (research, trials and pilot projects) and the development of economic activities.

The MIP 2011-2013 (MIP II) is under preparation. Some of the areas of potential focus for MIP II include: (a) increasing cane production by improving productivity and efficiency, and expanding the cane area; (b) support to social services; (c) transport logistics (e.g. sugar cane hauling and scheduling); (d) and continued support to LUSIP 2. It would also seem that no more road infrastructure will be considered, beyond completing on-going projects. Nevertheless, this is only an indication, as scope of MIP II, and implementing modalities, is still under discussion.

2.4 Methodology and tools

This StrEA makes use of a combination of tools. The Scoping phase was aimed at identifying the key environmental aspects relevant to the StrEA, addressed in further detail in the StrEA Study. Identification of key environmental aspects was based on: (1) comprehensive literature review, including: relevant policies, plans, programmes, regulations, consultants' reports, and professional and academic publications; (2) bilateral interviews with key stakeholders (see Appendix 6); (3) site visits to sugar cane areas (existing and under development - LUSIP), Farmers' Associations, estate and sugar factory; and (4) expert judgement. Key stakeholders were given an opportunity to comment on the scoping report.

As for the StrEA Study phase, the following mechanisms and tools were used for impact identification, impact evaluation and preparation of recommendations: (1) literature review complementary to that carried out during scoping; (2) bilateral interviews with key stakeholders (see Appendix 6); (3) focused bilateral interviews to explore specific issues arising from the scoping phase; (4) site visits to: sugar cane growing areas (existing and under development – LUSIP and KDDP), sugar cane estates and sugar factories, Farmers' Associations; (5) stakeholders' workshop to validate preliminary findings and explore potential ways to address the key aspects (see Appendices 7 and 8); (6) use of Leopold-type matrices for identification and assessment of potential impacts; (7) use of cause-effect diagrams; and (8) expert judgement.

2.5 Assumptions, uncertainties and constraints of the SEA

There were no major factors that hindered the StrEA process. Nevertheless there were some minor shortcomings related to: (a) ownership of the process by the GoS, (b) timing of the StrEA; and (c) access to certain information and stakeholders.

This StrEA process was driven almost exclusively by the RDMU and the EC, having been conceived that way. The GoS stood mainly at the receiving end. Although key government institutions (and parastatals) were very helpful throughout the process (e.g. in providing information, setting interviews and generally being available for consultations), the fact that they were not in the driving seat of the StrEA implies a risk of reducing chances of the findings being integrated in the NAS. However, an ideal government-owned-and-led StrEA process would have required a large degree of environmental awareness and environmental mainstreaming at the institutional level (mainly the MEPD, SSA) from the early stages. Such a scenario could be helped for the future by reinforcing the policy dialogue on environmental sustainability and ensuring full implementation of the Swazi Strategic Environmental Assessment provisions under the Environmental Management Act.

This StrEA took place at a late stage in the relevant policy-making and planning processes. Ideally it should have occurred at the time the NAS was being conceived (2006). As it stands this StrEA is being completed four years after the NAS was developed and right when the MIP II is being finalised. In this context it will be very important to widely discuss the findings of the StrEA in NAS Steering Committee and try to secure firm and time-bound commitments

for implementation. For future StrEAs it is highly recommended that the StrEA process is triggered at an early stage of policy-making and planning.

Finally difficulties were encountered by the consultants in obtaining certain information and accessing some specific stakeholders. These shortcomings were especially important with regards to water management issues. The Department of Water Affairs (DWA) proved an elusive stakeholder, to the point that it was not possible to set up any interviews with them. Thus it was not possible to explore in detail the functioning of the DWA, its role in monitoring water quality and water allocations, its role in the transfer of competencies to the RBAs, or confirm the particulars regarding the water quality monitoring programme (e.g. location of sampling stations, regularity of monitoring, parameters being controlled, findings). The team thus relied on interviews with other relevant stakeholders also concerned with water management issues (e.g. RBAs, SEA, sugar mills) as well as the ample experience of the StrEA team's local consultant.

There are some gaps of information in Swaziland, e.g. in relation to water quality in the country's rivers, quality of effluent discharges and atmospheric emissions, agricultural run-off, water balance for the different river basins, recent forecasts for water use in different sectors, and effects of climate change (down-scaled models). Some of these gaps of information were more important than others. The analyses in this StrEA Study made some assumptions when these were realistic and there was other information to back them up, but also acknowledged gaps of information. Sometimes recommendations are clearly focused on ensuring such gaps of information are covered, and then outline possible action points in case the information generated eventually shows an undesirable situation (e.g. in relation to water contamination from agricultural run-off).

In spite of the above observations, these were not significant shortcomings, and our overall appreciation is that the positive aspects of this StrEA by far outweighed its shortcomings. The findings of this StrEA are solid; they have been validated by the multiple consultations with stakeholders; and points of uncertainty are clearly pointed out (e.g. where information was not available). Care has been taken to provide focused recommendations on the areas where key issues can be tackled in a more efficient and effective matter. In this sense the StrEA only focuses on key aspects, and these were prioritised; the driving factors (causes) contributing to the significance of the impacts were identified in order to be the focus of remedial actions; and care was taken to address all relevant components of each key aspect (institutional, regulatory, biophysical, etc).

3 THE SUGAR SECTOR IN SWAZILAND

Sugar is the backbone of Swaziland's economy. The agriculture sector contributes approximately 8.6% of the national GDP, and sugar cane makes up 74% of that. When adding the production of sugar and sugar by-products to the equation, we have that the sugar industry, as part of the agricultural as well as of the manufacturing sector, directly accounts for 12% of the overall country's GDP. As well it also contributes indirectly through its links to other sectors, such as banking and services.

Up to around 2003 the sugar industry accounted for approximately 10% of formal sector employment. However, changes in the economy and the depreciation of the Euro against the Rand have led to a decline in the formal employment in the industry. The industry also contributes to human development through the provision of social services such as housing, clean water, education, health care and recreation to employees, their households and neighbouring communities. Some of these services are at the moment jeopardised due to the reform of the sugar sector, and are subject of attention by the NAS.

Sugar cane is currently grown on approximately 52,068 ha by the mill estates, commercial farmers and small cane growers (SSA Annual Report 2008-2009). The area under sugar cane is currently under expansion through two large irrigation projects: the Komati Downstream Development Project (KDDP) and the Lower Usuthu Smallholder Irrigation Project (LUSIP). In the LUSIP area approximately 800 ha have been planted and a total of 3,500 ha are expected by 2012.

Sugar cane is grown under irrigation in Swaziland; it is also and by far the main user of available surface water, with 96% of the total. Land under sugar cane is grown mainly on Individual Tenure Farms (ITF) or on Swazi Nation Land (SNL) leased by estates. More recently development of irrigated sugar cane on SNL by smallholders has started under the KDDP and LUSIP projects. Most of the sugar cane is grown in the vicinity of the sugar mills, although there are areas under sugar cane further afield, such as in Malkerns and Sidvokodvo.

Currently there are three sugar mills in Swaziland, which together milled about 5.3 million tonnes of cane in the 2008/2009 season and produced around 620,000 tonnes of sugar[3]. The Royal Swazi Sugar Corporation (RSSC) owns the northern mills and miller-cum-planter estates at Mhlume and Simunye, while the Illovo Sugar Company owns the Ubombo Sugar's mill in Big Bend.

By 2006 the estates of the two milling companies and the few large growers (including Tibiyo Taka Ngwane, Tambankulu Estates and Crookes Plantations) accounted for 77%[4] of the area planted and 81% of all cane produced. However, in the last ten years the number of small growers has increased, and expected to further increase through KDDP and LUSIP. Such farmers are organised under Farmers' Associations (FA), Farmers' Companies or independent growers. In the three cane growing areas, at least 150 medium- and small-scale growers have arisen, most of which are Farmers' Associations.

A new sugar cane area and sugar mill is being proposed for the Sidvokodvo area, which could better service the cane growers in Malkerns.

Distilleries are also considered as part of the sugar industry, as their prime raw material is molasses, a by-product of the sugar production process. There are two distilleries currently

3 Information provided by RSSC and Ubombo Sugar for 2009.

4 The land under sugar cane at the three mill estates is as follows (2010 data): Mhlume Sugar Estate: 9,595 ha; Simunye Sugar Estate: 11,309 ha; Ubombo Sugar Estate: 8,171 ha.

operating in Swaziland, one in Simunye, which is part of the RSSC and USA Distillers in the Big Bend area (not commercially linked to Ubombo Sugar). The distillery in Simunye produced 25.9 million litres of ethanol in 2009, whilst USA Distillers have a distilling capacity of about 20 million litres of ethanol per year. The main by-product of the distilling process is vinasse, which can be highly polluting if not properly managed. The Simunye distillery produces Concentrated Molasses Solids (CMS) from the vinasse produced, which are mixed with other nutrients and commercialised as fertiliser. USA Distillers, on the other hand, had in the past pollution incidents from the release of vinasse into the Usuthu River. Currently USA Distillers sends their vinasse to a storage dam, and there are plans to produce liquid fertiliser with it.

4 STATE OF THE ENVIRONMENT IN SWAZILAND[5]

4.1 Location and demography

The Kingdom of Swaziland is a landlocked country located in South Eastern Africa between latitudes 25° and 28° South and longitudes 31° and 32° East. It has a total surface of 17,360 km^2 and shares borders with the Republic of South Africa (RSA) in the north, west and south and Mozambique in the east. According to the 2007 census, Swaziland has a total population of 1,018,449 out of which 22% is urban and 78% rural, and a population density of about 58 people per km^2.

Administratively Swaziland is divided into four administrative regions (also known as administrative districts): Hhohho in the north, Manzini in the centre, Shiselweni in the south and Lubombo in the east (see Figure 1). A Regional Administrator administers each of the four regions. The headquarters of the regions are Mbabane, Manzini, Nhlangano and Siteki for Hhohho, Manzini, Shiselweni and Lubombo regions, respectively.

Geologically, Swaziland is located at the transition of the South African Plateau to the Mozambican coastal plain. The western part of the country lies in the escarpment zone and the eastern part in the coastal plains. The Lubombo range separates the coastal plains of Swaziland and Mozambique.

Swaziland is classified into six Agro-Ecological Zones (AEZ), taking into account elevation, landforms, geology, soils, climate and vegetation: the Highveld, the Upper Middleveld, the Lower Middleveld, the Western Lowveld, the Eastern Lowveld and the Lubombo Range. Landforms range from plateaus, hills and mountains, to foot slopes and plains.

Figure 1: Administrative regions in Swaziland

5 Information taken to a large extent from the State of Environment Report for Swaziland (2001) and the Country Environmental Profile (2006).

4.2 Climate and climate change

Swaziland has a sub-tropical climate, with warm wet summers and cool dry winters, although climatic conditions vary from region to region. Mean annual rainfall ranges from 700-1550 mm in the Highveld to 400-550 mm in the Lowveld; in the Middleveld and the Lubombo Plateau rainfall ranges between 550-850 mm[6].

Mean annual temperatures range from 17°C in the Highveld to 22°C in the Lowveld. During the summer mean temperatures range from 20°C (Highveld) to 27°C (Lowveld) and in the winter from 12°C (Highveld) to 18°C (Lowveld) (Simelane, 2007).

The high vulnerability of Africa to various manifestations of climate change has been confirmed by the Inter-Governmental Panel on Climate Change (IPCC) and other reports. According to Swaziland's first National Communication to the United Nations Framework Convention on Climate Change (UNFCCC), the projections from the climatic models point to temperature increases in the future with varying magnitudes, but mixed results with regards to precipitation projections. The report states that *"in general, the models project total annual rainfall amounts by 2075 falling below those received under current climate by single digit percentages. The monthly situation projects amounts that are higher than those under current climate in the late spring to midsummer period (October to January). For the rest of the months of the year projections give future rainfall amounts that are lower than under current climate"*.

A consequence of the above is that *"as most of the country's annual rainfall is received over the summer period, an increase in precipitation over this period is likely to result in flooding conditions. The projections on winter rainfall reduction also pose the problem of higher possibilities of drought occurrences"*.

According to the World Bank's Climate Change Data Portal, the climate change models disagree on whether Swaziland will become wetter or drier (e.g. the Global Climatic Models – GCMs – reviewed by the IPCC indicate reduced mean annual precipitation in the order of 4% by 2050, but a high resolution model indicates an increase of 21% by 2100). Temperatures are expected to increase in the order of 1°C by 2050 (IPCC GCMs) and 2°C by 2100 (high resolution GCM). A moderate decrease in run-off (>35%) is expected, and a caution is given to that effect: *"these areas are quite prone to desertification, so strict water management and sustainable land uses are important issues to consider"*.

4.3 Ecology and biodiversity

The country is divided into four distinct agro-ecological zones, based on elevation, landforms, geology, soils and vegetation (Van Wavere, and Nhlengetfwa, 1992), as shown in Figure 2 below. Each of the three regions, the Highveld, the Middleveld and the Lowveld, occupy about one-third of the country, whilst the Lubombo Range occupies less than one-tenth of the country.

The Highveld, which runs along the western border of the country, is the upper part of an overall escarpment consisting of a complex of steep slopes between low and high levels, dissected plateaus, plateau remnants, and associated hills, valleys and basins. The upper Middleveld consists of strongly eroded plateau remnants and hills at an intermediate level of the overall escarpment with structurally defined basins in relatively protected positions. The Lower Middleveld is basically the piedmont zone of the escarpment, characterised by generally strongly eroded foot slopes.

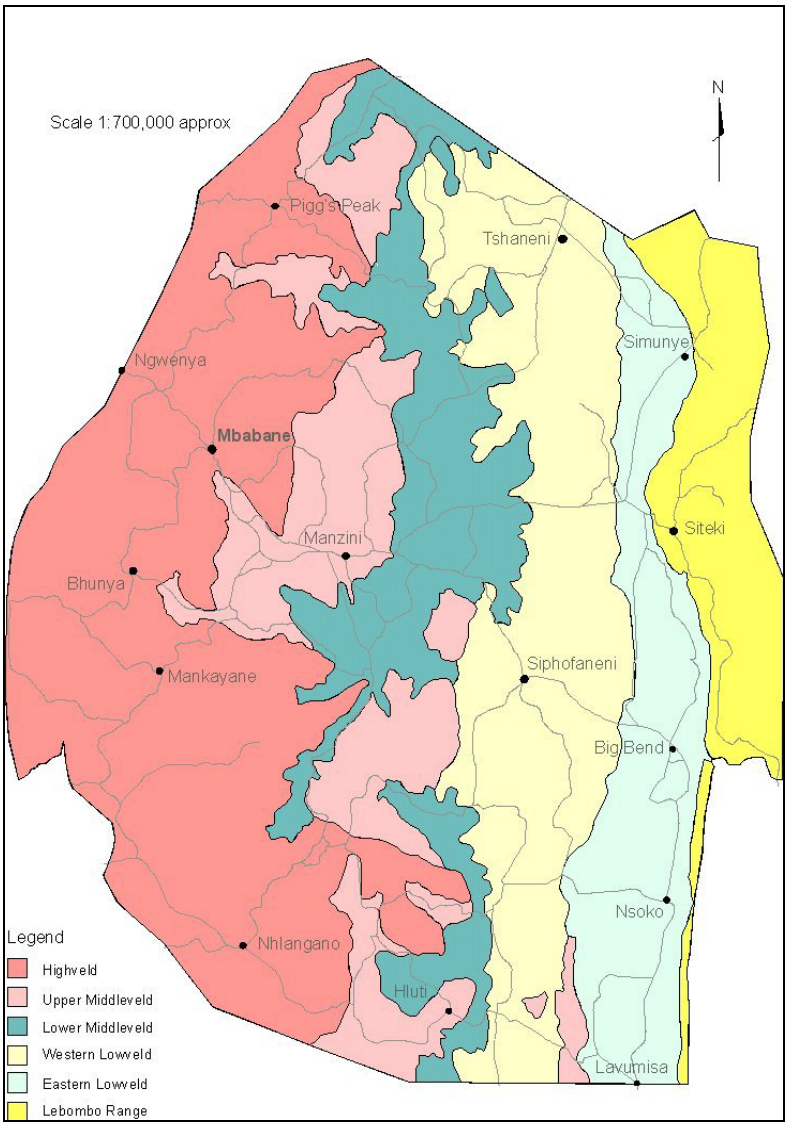
6 Water Profile of Swaziland – Encyclopaedia of Earth (http://www.eoearth.org/article/Water_profile_of_Swaziland)

There are four ecosystems in Swaziland: (1) montane grasslands, (2) savanna-woodland mosaic, (3) forests, and (4) aquatic systems. The savanna-woodland mosaic is the dominant ecosystem, covering the central and lower parts of the country, followed by the montane grasslands (mainly in the Highveld); together, both of these ecosystems comprise 94% of the country.

Considering its small size, Swaziland is very rich in biodiversity, and species composition varies greatly between ecosystems. The information base for the biodiversity in Swaziland is still incomplete, buy surveys have shown that a significant portion of Southern African plant and animal species occur in the country. For example, the eastern region of Swaziland forms part of the Maputo land centre of plant diversity, one of the world's hotspots of flora and fauna richness and endemism, whilst the western region falls under another area of global significance, the Drakensburg Escarpment Endemic Bird Area.

To date over 820 species of vertebrates and 2,414 species of plants have been recorded for Swaziland, including 18 endemic species of plants and one endemic vertebrate.

Figure 2: Agro-ecological zones in Swaziland



4.4 Land and land tenure

Land tenure in Swaziland falls under two main categories: communal land held in trust by the King on behalf of the Swazi nation, called Swazi Nation Land (SNL), which comprises about 74% of the territory, and land under Title Deed (Title Deed Land – TDL), comprising about 26%. SNL is administered by the Chiefs; however, part of the SNL is controlled by government, parastatals or companies. TDL is mainly used for industrial timber plantations, livestock production and sugar cane, and the SNL area for communal extensive grazing and subsistence farming.

4.5 Water resources and water quality

There are five major river systems in Swaziland: Lomati, Komati, Mbuluzi, Usuthu and Ngwavuma (see Figure 3). All five are transboundary river systems. The Lomati, Komati and Usuthu originate in South Africa, pass through Swaziland, back to South Africa and finish at the Indian Ocean through Mozambique. The Mbuluzi and the Ngwayuma Rivers both originate in Swaziland; the former flows into Mozambique, whereas the latter flows into South Africa (joining the Pongola River in South Africa) before entering Mozambique. A sixth river system contributing surface water is the Pongola River, found on the South African side south of Swaziland; the Jozini dam built in South Africa floods some land on the Swaziland side and its water is available for use in Swaziland.

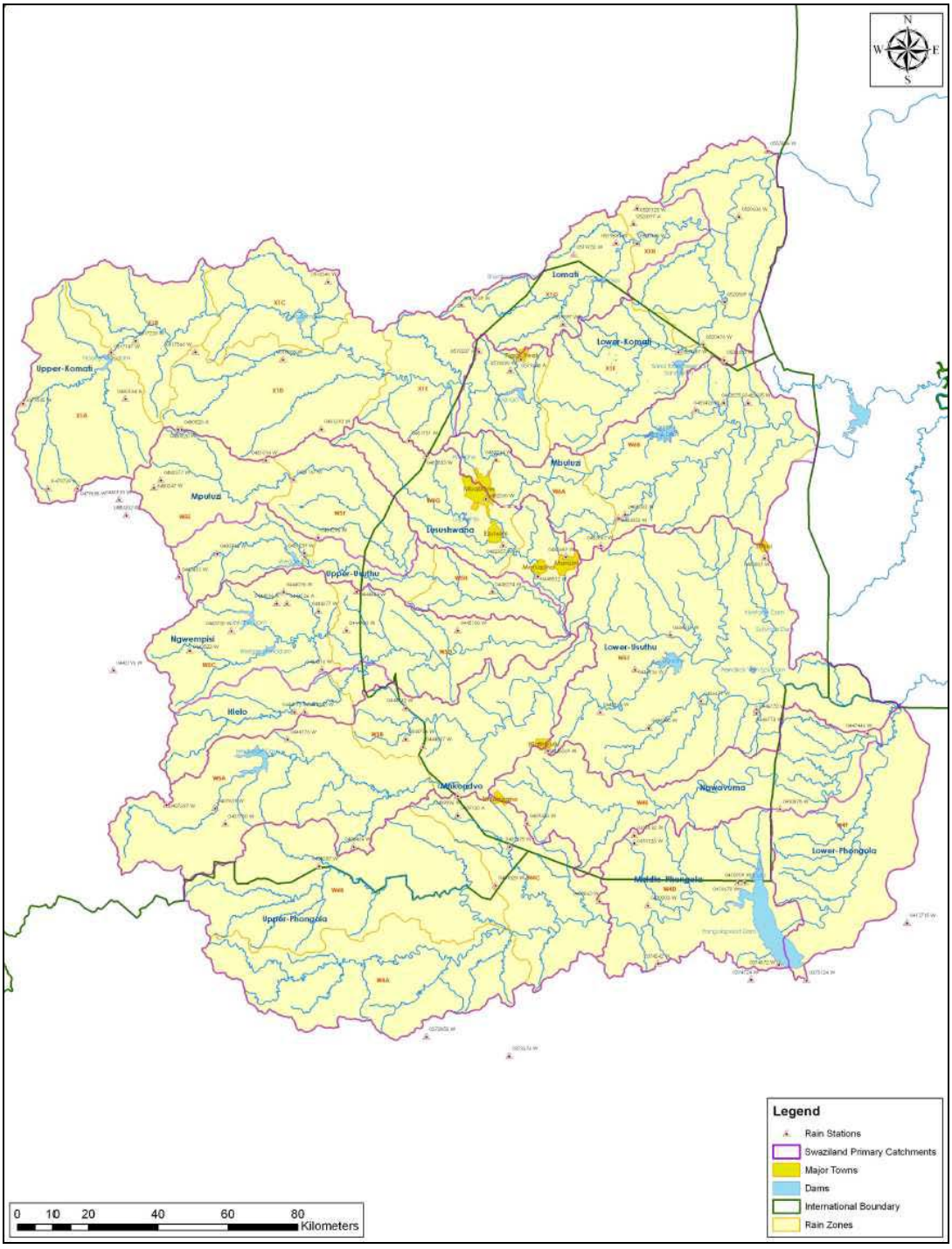
There are 11 major dams in Swaziland that store water for irrigation, domestic and industrial purposes, with a combined storage capacity of 743.2 Mm^3 (see Table 1).

Table 1: Main storage dams in Swaziland

Name	River system	Capacity (Mm^3)
Hendrick Van Eck	Usuthu	10.4
Luphohlo dam	Usuthu	23.6
Mnkinkomo weir	Usuthu	3.2
Lubovane dam	Usuthu	155
Nyetane dam	Usuthu	6.0
Sivunga dam	Usuthu	6.9
Maguga dam	Komati	332
Sand River dam	Komati	50
Mnjoli dam	Mbuluzi	153
Hawane dam	Mbuluzi	2.75
Lavumisa dam	Pongola	0.35

Source: Manyatsi and Brown (2009)

Figure 3: Swaziland river network



Groundwater resources have been poorly studied and exploited in Swaziland. A survey carried out between 1986 and 1991 by the Department of Geological Surveys and Mines concluded that the groundwater potential was equivalent to a sustained flow of 21 m^3/s, of which 1,400 boreholes had tapped only 6% by 1992. To date there are over 2,000 boreholes in Swaziland, most of them (over 1,340) in the Swaziland portion of the Maputo River basin. It is estimated that the groundwater recharge rates range between 2 and 10% of average annual rainfall.

Most of the water in Swaziland (96%) is used for irrigation, of which sugar cane is the main crop. More details on the water balance and water use by the sugar sector is provided in the baseline for Key Aspect 1 on water availability below.

There is little information in Swaziland on water quality. Information that is available shows a general deterioration due to chemical pollution from commercialised agriculture and industrial pollution (Simelane, 2007). Some of the sources of pollution cited include leachate from improperly managed solid waste disposal sites, and "accidental" spillages of toxic substances like phenol. Industrial pollution seems to occur mainly in the Usuthu Basin, in Matsapha and upstream. The contribution of sugar cane farming to water pollution is poorly studied, in part due to a lack of appropriate regulations.

4.6 Air quality

Swaziland enjoys good air quality, and there are no major air pollution concerns, either from point- or non-point sources.

4.7 Energy

There are four major sources of energy in use in Swaziland: electricity, petroleum products, wood fuel and new and renewable energy sources. The only ones available locally are coal and renewable energy sources.

Swaziland has reportedly large reserves of low volatile and low sulphur anthracite of medium to high quality. This coal is less environmentally harmful but does not ignite easily and is more expensive.

The two main renewable sources of energy in Swaziland are biomass and hydroelectric power. Biomass fuels are available from the sugar and forestry industries. Bagasse from the industrial forestry sector is reported to be landfilled. As for the sugar industry bagasse is burnt by the sugar mills to produce electricity to satisfy a portion of their energy requirements, and initiatives are on the way to use cane trash and tops as fuel for co-generation of electricity.

Swaziland also produces hydroelectric power through four hydroelectric schemes, contributing about 23% of energy supply in the country.

Figures 4 and 5 illustrate the Swaziland energy supply in 1995 and 2005.

Figure 4: Swaziland Energy Supply 1995

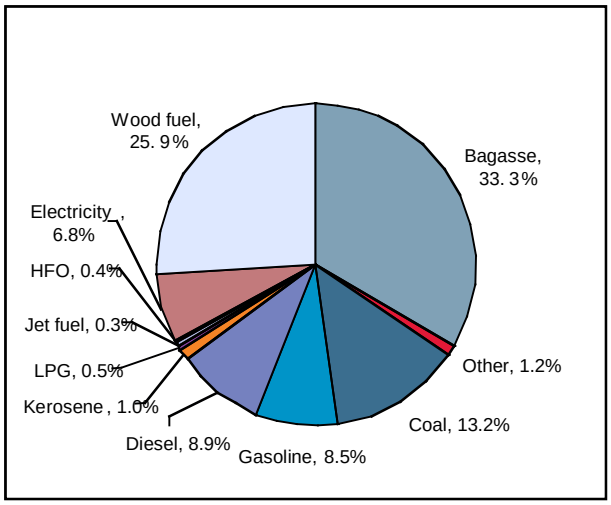
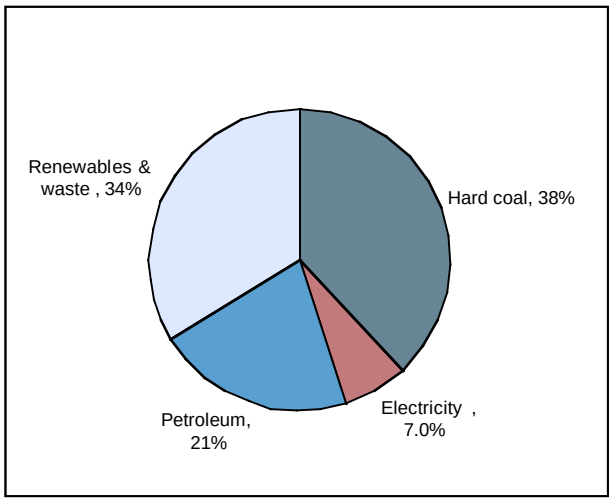


Figure 5: Swaziland Primary Energy Supply 2005



Source: MNRE. National Energy Policy Implementation Strategy (2009), Energy Department

4.8 Environmental concerns

The Country Environmental Profile (CEP) for Swaziland identifies a large set of areas of environmental concern associated to: land and water management, land degradation and pollution, ecosystem and biodiversity degradation, climate change, and living conditions in human settlements. In reviewing the findings of the CEP together with the State of the Environment report (2001) and relevant environmental policy documents, the following key concerns can be discerned:

- Limited water availability exacerbated by risks associated to the effects of climate change;
- Serious to very-serious soil erosion of communal grazing lands, mainly associated to increased livestock population together with reduction of grazing lands;
- Soil degradation of land under irrigation, especially in the Lowveld;

- Decline in biodiversity (mainly large mammals and indigenous flora), mainly related to expansion of agro-industry (sugar cane and timber), dense subsistence farming and settlements, over-harvesting of flora species, fuel wood exploitation, commercial exploitation of plants and animals for export, encroachment of bush in the savannah woodland ecosystem associated to over-grazing, and proliferation of invasive species;
- Deforestation and degradation in the natural forest and woodland areas, associated to conversion of land to agriculture (especially sugar cane), uncontrolled extraction of forest products from commercial land and large livestock populations;
- Water pollution due to run-off of pesticides, industrial “accidental” discharges and sediment load from soil erosion.

There are other environmental issues in Swaziland, but the list above should be a good indication of the most pressing aspects. Other aspects not to neglect include: solid waste management; run-off of agrochemicals; indoor air pollution due to burning of coal and biomass; and poor sanitation.

5 ENVIRONMENTAL IMPACTS OF THE NAS

5.1 Introduction

The key issues of concern were identified in the scoping phase and validated through the stakeholders' workshop. Key Aspects are categorised as 'High Priority', 'Medium Priority' and 'Low Priority'.

High Priority Aspects

Key Aspect 1. Water availability/Climate change

Key Aspect 2. Long-term social and environmental sustainability of small-cane growers

Key Aspect 3. Loss of biodiversity due to land-take for sugar cane expansion

Key Aspect 4. Risk of HIV/AIDS associated with the sugar cane industry, particularly in relation smallholder irrigation schemes

Medium Priority Aspects

Key Aspect 5. Emission of POPs from sugar cane burning and socio-economic implications of green cane harvesting

Key Aspect 6. Water pollution from agricultural run-off/monitoring of water quality

Low Priority Aspects

Key Aspect 7. Regulation of effluent discharges

Key Aspect 8. Regulation of atmospheric emissions

The sections below explore in more detail the environmental baseline associated to the key aspects identified, including cause-effect relationships, trends, expected state of the environment in absence of the NAS and expected effects of the NAS on the key aspects. As the NAS was prepared in 2006 and some of the measures it foresees have already been implemented, or are imminent, the 'no implementation of the NAS' scenario is not relevant for some key aspects.

The analyses provided are the bases for identifying recommendations to enhance the environmental performance of the NAS. Figure 28 and Figure 29 (Annex 1) show – in the form of Leopold-type matrices - the areas in the sugar sector that are having an impact on the environment (environmental performance of the sugar sector), as well as the potential impacts of implementing the NAS.

Figures 6-10 below present – in the form of flow diagrams - a synthesis of the key cause-effect relationships between NAS components and the environment (including its socio-economic dimension), showing the main contextual aspects that have an incidence on determining impact significance, and highlighting areas through which these key aspects could most effectively be addressed in the context of the NAS and EC support. These diagrams primarily address the high- and medium-priority aspects.

Notice in the discussions below that the headlines for the key aspects addressed in this report do not match exactly those in the scoping report. The reason is that some of the key aspects were clustered to allow a more effective and focused analysis.

Figure 6: Cause-effect relationships associated to increase of land under sugar cane (Part 1/2)

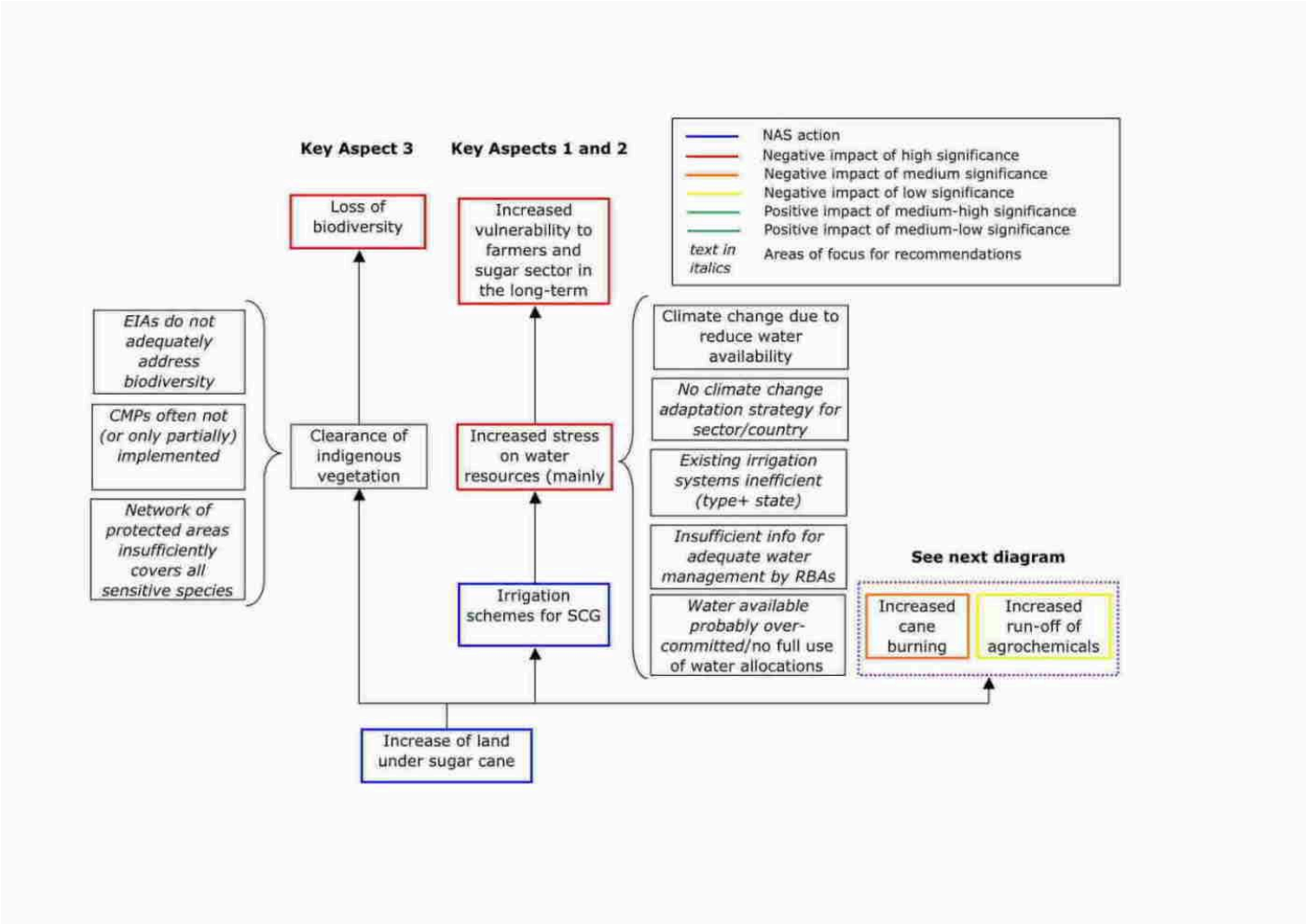


Figure 7: Cause-effect relationships associated to increase of land under sugar cane (Part 2/2)

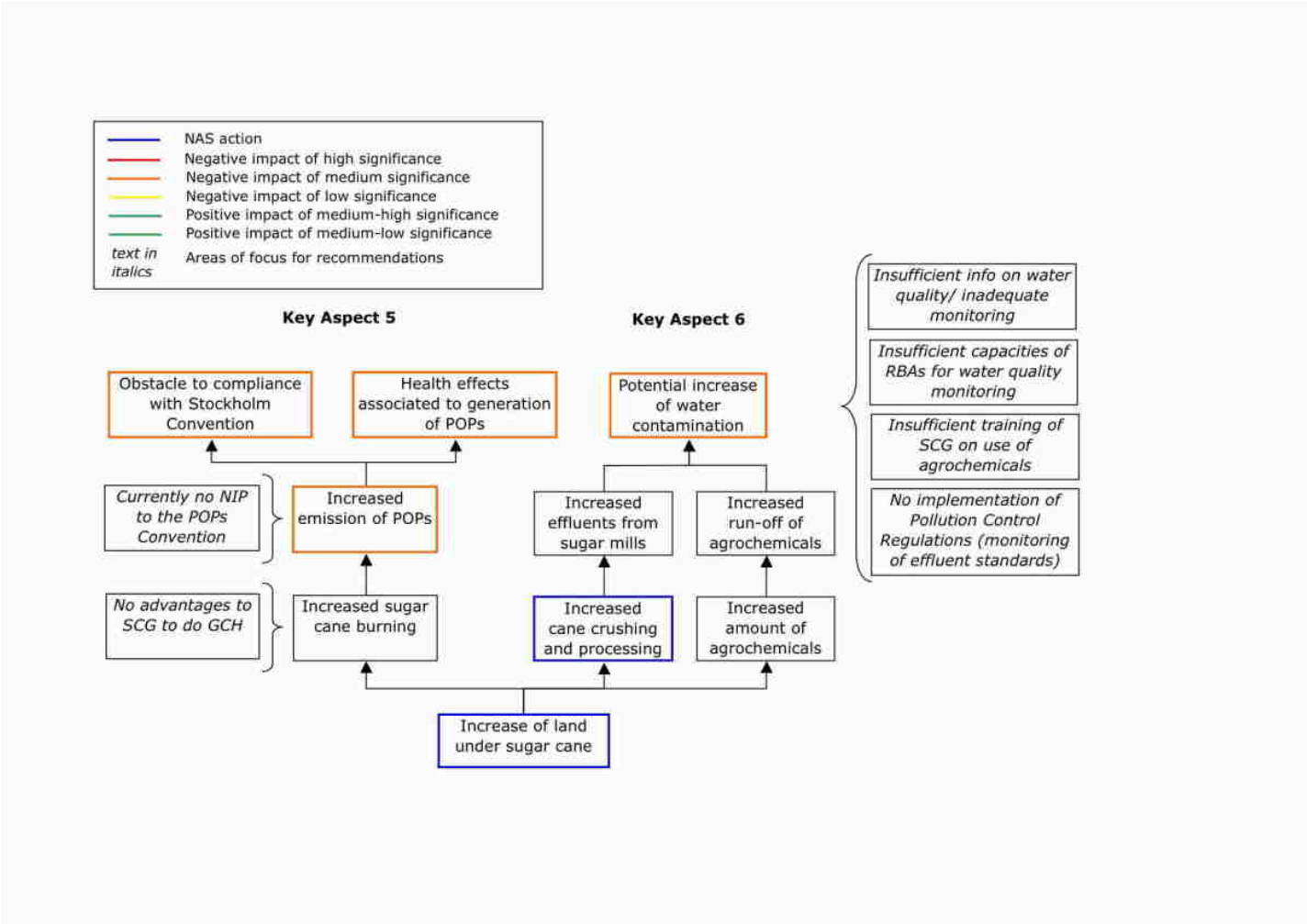


Figure 8: Cause-effect relationships associated to co-generation of electricity using cane tops and trash

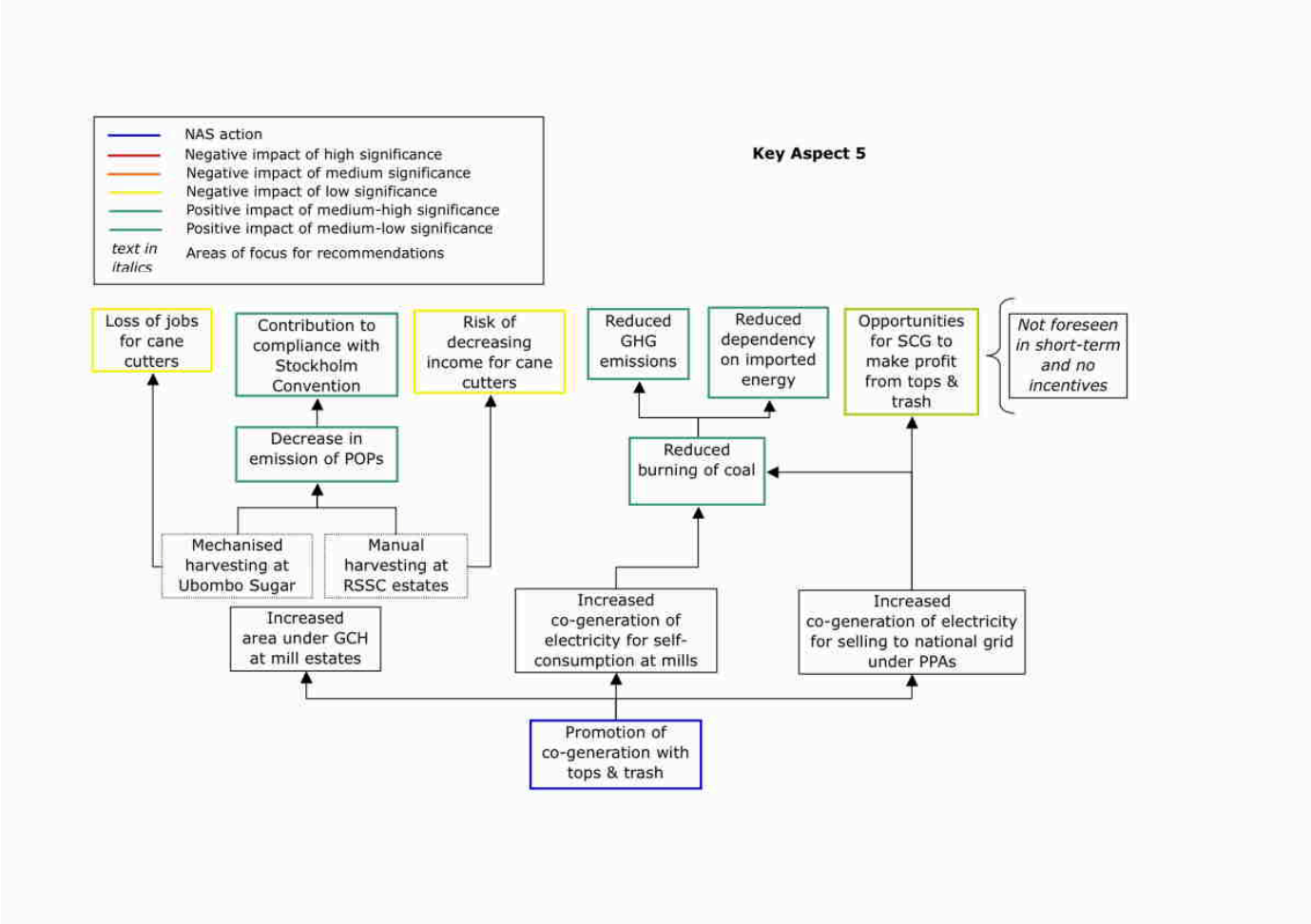


Figure 9: Cause-effect relationships associated to the establishment of new Farmers' Associations

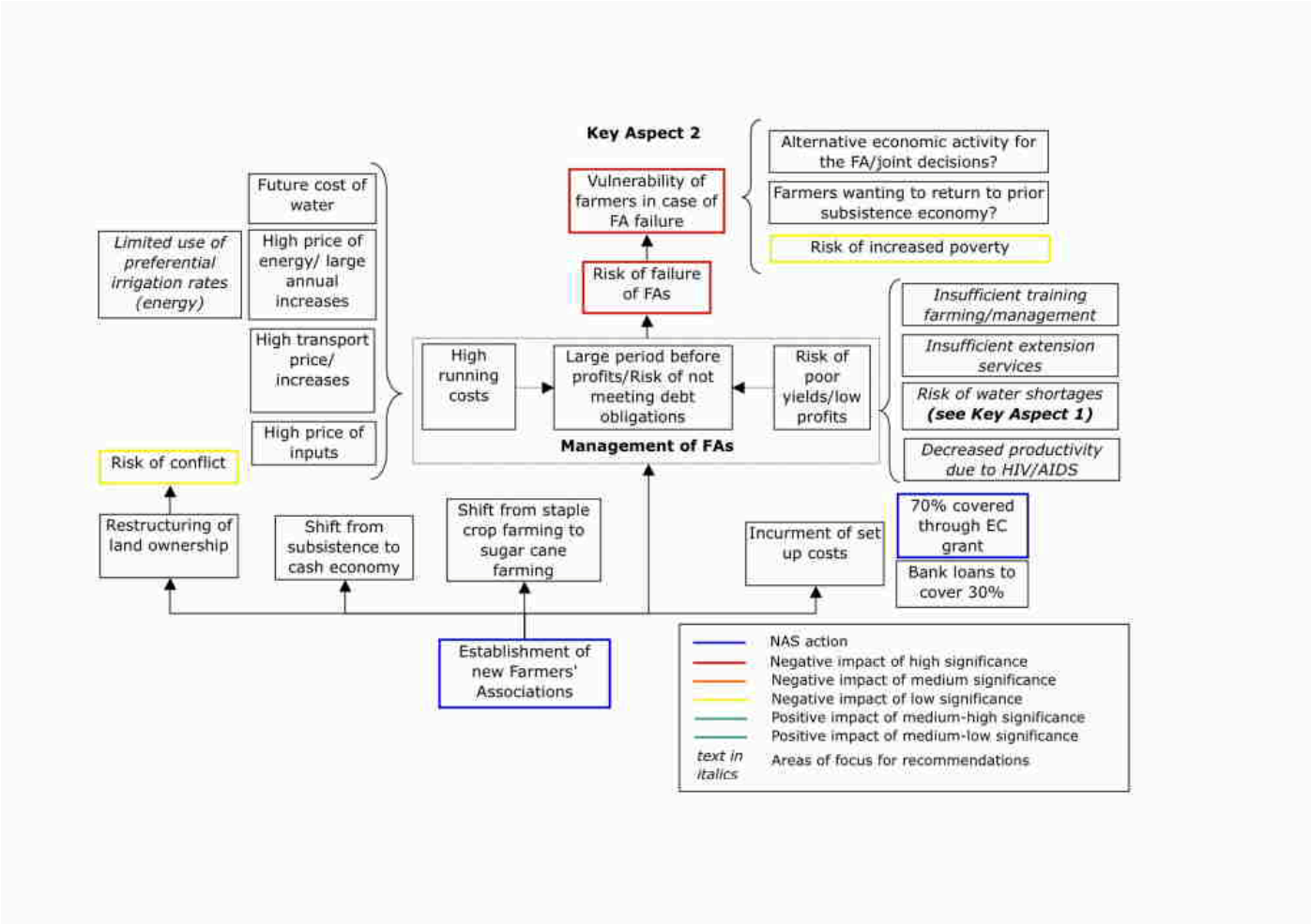
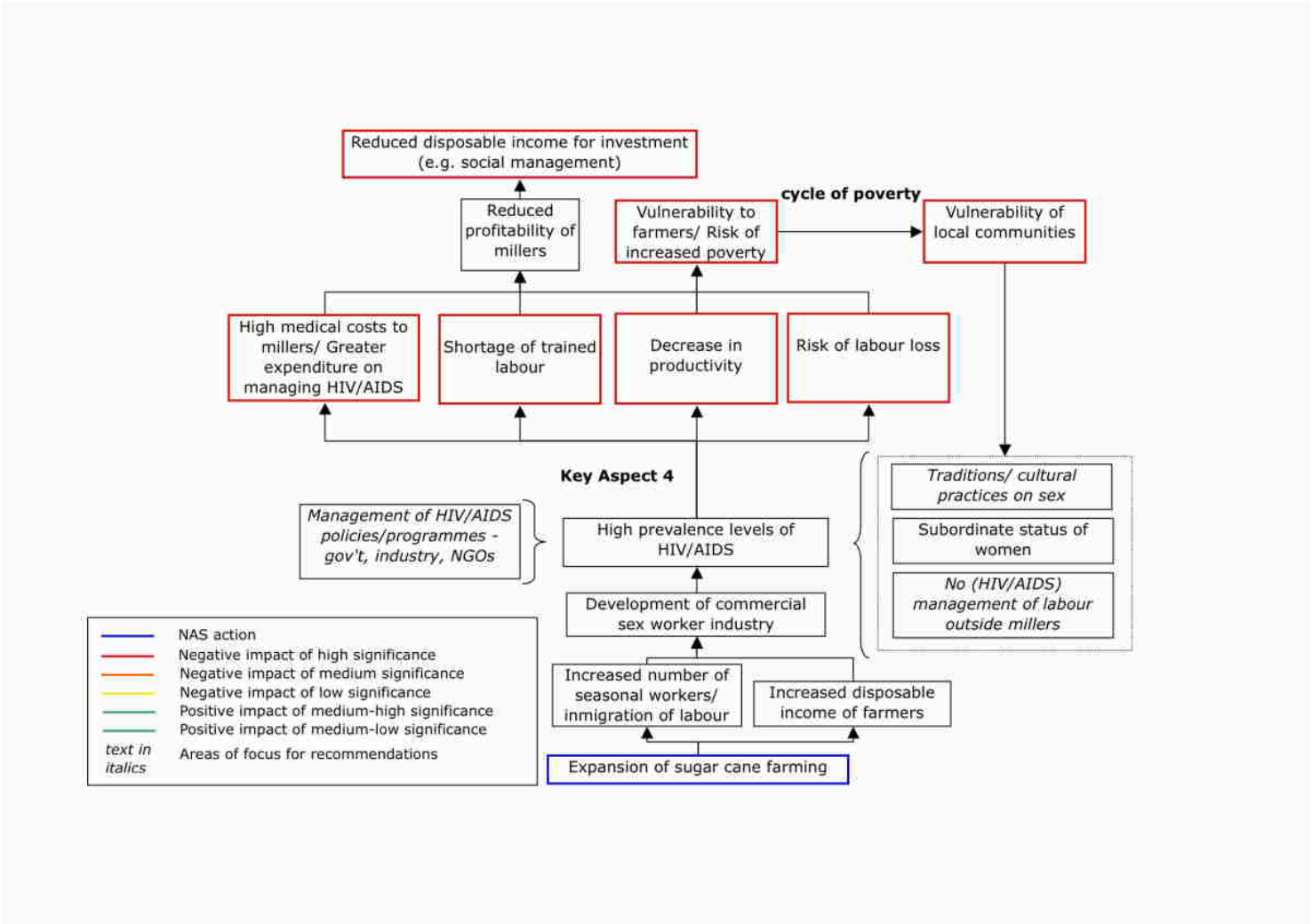


Figure 10: Cause-effect relationships associated to HIV/AIDS



5.2 Key aspect 1: Water availability / Climate change (High Priority)

5.2.1 Current state

Water is essential for life, yet its quantity is limited and its distribution varies seasonally and with drought and flood cycles and spatially over the different climatic regions of the country. Water is also essential for development and economic progress while minimum quantities are required to maintain the ecological health of river systems. Thus it is imperative that available water resources are developed, managed and utilized to derive maximum benefit.

Swaziland lies in the Inkomati, Mbuluzi and Maputo River Basins. Water flows into these rivers via several streams and tributaries from the eastern highlands of Swaziland and South Africa, which then discharges into the Indian Ocean along the Mozambique coastline.

5.2.1.1 Policy, regulatory and institutional framework

Swaziland has a comprehensive legislative and policy framework for water management[7].

The **Water Act** of 2003 is the law governing the use and management of water resources. It seeks to integrate and decentralise water management and to consolidate its administration under one ministry. It established the **National Water Authority** (NWA) that is composed of representatives from key government ministries, from industry, from Water Users Associations (WUAs) and individuals on Swazi Nation Land. The NWA advises the minister responsible for water affairs and it also provides direction on water issues such as policy development and other related issues in the land.

The **Department of Water Affairs** (DWA) is secretariat for the NWA. The Act also establishes five **River Basin Authorities** (RBAs) through which basin-specific water management processes will evolve. The establishment of the River Basin Authorities in 2009 has passed down water management responsibilities to the basin level. Each authority is to become self-sustaining through the imposition of fees and levies for water supplied and services provided. The Water Act empowers each RBA to develop its own pricing structure for the water that they allocate and manage. In terms of the 2003 Water Act, RBAs have a variety of responsibilities for monitoring water quantities and qualities within their basins.

Supporting the Act is a **draft Water Policy** and a **draft Integrated Water Resources Management (IWRM) Plan**. The policy provides the long-term vision for water management whilst the IWRM Plan provides the strategies for achieving the vision.

The Water Policy is still in a draft stage pending national validation at a soon to be organised national validation workshop. An important element of the policy is improvement of water availability for both socio-economic and economic productivity. The policy also provides clear demarcation of the responsibilities of the various stakeholders and institutions involved in the integrated development and management of water resources in the country.

The Integrated Water Resources Master Plan, still a working draft, seeks to combine essential IWRM principles and procedures (namely stakeholder consultation, capacity building, training and research in water development and management) as well as integrating sustainability issues. The IWRM Plan seeks to *"promote the co-ordinated development and management of water, land and related resources, in order to maximize the resultant*

7 See Annex 3 and 5 of the Scoping Report for detailed descriptions of the legislative and policy framework.

economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems".

Internationally Swaziland has ratified several protocols governing transboundary issues. The Treaty on Development and Utilisation of the Water Resources of the Komati River Basin between the Kingdom of Swaziland and the Government of the Republic of South Africa, and the Tripartite Interim Agreement between the Republic of Mozambique, the Republic of South Africa and the Kingdom of Swaziland for co-operation on the protection and sustainable utilisation of the water resources of the Incomati and Maputo watercourses are all being respected.

5.2.1.2 State of water resources in Swaziland

The Water Act declares all water found in the country a national resource and requires all users to have permits for use of the water. It is however, not necessary for any person or community to obtain a permit for use of water for primary (subsistence) purpose[8]. The RBAs are responsible for the issuing of water abstraction permits. Water is allocated on volumetric basis, and in the case of irrigation it is allocated on the basis of crop water requirement.

Swaziland's **Water Act (2003)** states that during a drought situation, the Water Apportionment Board shall issue a rationing notice to all permit holders to adjust their abstraction quantities depending on the severity of the prevailing drought situation. The policy states that the rationing notices will be issued in the following order:

Irrigated agriculture
Industrial activities
Stock watering
Domestic water use

This rationing should go hand-in-hand with effective monitoring of all water users.

According to the draft IWRM Plan (May 2009) the existing river systems within Swaziland are under stress due to an increase in population, industrialisation, an increase in irrigated agriculture and increased pollution of water resources, notwithstanding the fact that the supply of potable water to the population remains low.

Only 5.4% of the **Komati River basin** lies within Swaziland, where it is drained by the Komati River. In Swaziland the river is regulated by Maguga dam and a tributary by the Sand River dam. Irrigation is by far the largest water user in the Swaziland portion of the basin.

The majority of the **Mbuluzi River basin** (58%) lies within Swaziland, where it is drained by the Mbuluzi River. The Hawane dam supplies Mbabane with water and the Mnjoli dam secures water for the sugar cane estates in eastern Swaziland. Water from the Sand River dam in the Komati River basin is transferred to sugar cane estates in the Mbuluzi River basin via a canal. Irrigation is again by far the largest water user in the Swaziland portion of the basin.

The majority of Swaziland lies in the **Maputo River basin**, drained primarily by the Usuthu and Ngwavuma Rivers. The three major dams in Swaziland are Lake Luphohlo (used in the generation of hydro-power), the Lubovane Reservoir and the Nyetane dam (both used for irrigation purposes). The GoS is investigating additional dam sites, as shown below.

8 "Use for primary purpose" means the use of water for domestic requirements, sanitation, the watering of animals not exceeding 30 head of cattle or the irrigation of land not exceeding one-quarter hectare adjoining or occupied with a homestead of not more than 10 persons, but does not include the use of water by a local authority for distribution to the inhabitants of the area.

Table 2: Dam sites under investigation in Swaziland

Dam site (River)	Live storage capacity (Mm^3/yr)
Nondvo (Lusushwana)	94
Lebombo Gorge* (Usuthu)	2966
Merriekloof (Ngwempsisi)	165
Mgwadhla (Ngwempsisi)	80
Mgwadhla with Merriekloof upstream (Ngwempsisi)	80
Bakenkop (Mkhondvo)	231
Mahamba Gorge (Mkhondvo)	114
Lagubha (Mkhondvo)	121
Ethemba (Mkhondvo)	255
Ethemba (with Bakenkop upstream) (Mkhondvo)	255
Moti (Mkhondvo)	220
Moti with Ethemba upstream (Mkhondvo)	220
Mpakeni (Ngwavuma river)	149
Kubuta (Mhlathuzane)	11

* Lebombo Gorge is unlikely to be considered as a future dam because it will inundate the existing Big Bend town, sugar plantations and main roads resulting in huge costs required for land acquisition.

Table 3: Irrigated areas and their use in 2008

Producer	Area (ha) (2008)		
	Sugar	Non-sugar	Total area
RSSC Estate	20,136		20,136
Malkerns outgrowers	2,000	500	2,500
KDDP outgrowers	3,500		3,500
Vuvulane outgrowers	1,212		1,212
Other growers (commercial)	4,670		4,670
Ubombo Sugar	8,500		8,500
Others (commercial)	10,000		10,000
Citrus and other spp.		3,000	3,000
Other TDL farms		2,000	2,000
Other SNL schemes		500	500
Totals	**50,018**	**6,000**	**56,018**

5.2.1.3 Water usage and demand in Swaziland

The potential supply of surface water available for use within Swaziland averages about 2,630 Mm^3/yr, which is equivalent to an average flow rate of about 80 m^3/s.

The estimated water usage by irrigation throughout the country is about 992 Mm^3/yr (53 m^3/s). The maximum potential assured yield is about 1500 Mm^3/yr (47.6 m^3/s) (Knight Piésold, 1997). The water usage estimates for 1996 is presented in Table 4.

Table 4: Estimated water usage in Swaziland in 1996

Water use		Amount (Mm^3)	%
Domestic	Rural	9.75	0.9
	Urban	14.43	1.4
Livestock		12.51	1.2
Industry		12.02	1.2
Irrigation		992.65	95.3
Total		**1,041.36**	**100**

(Source: Knight Piésold, 1997)

The demand for water is strongly increasing as a result of expanding irrigation, industrial activities and domestic and other uses.

Table 5 shows the water usage per sector in the country's river basins, drawn from the works of several authors. Current sectoral water demand in Swaziland is approximated as follows: irrigated agriculture (96%), livestock (1%), industrial (1%) and domestic (2%). The industrial forest sector is also using large amounts of water; however, directly derived from rain and substantially reducing runoff.

Table 5: Estimated water demand (Mm^3/yr) on major river basins (1997)

River basin / Sector	Komati (incl. Lomati)	Mbuluzi	Usuthu	Ngwavuma	Pongola
Irrigation*	176.0	140.0	280.0	32.2	6.4
Urban domestic	22.0	15.0	12.036	0.468	2.0
Rural domestic			3.043	0.961	
Industry and others (University, schools, etc.)			12.437	0	
Livestock			9.74	2.061	
Fishery			0.191	0.034	
Forestry	50.0	0.1	62.963	0.024	0.5
Hydropower	----	---	525.6	23.7	----
Tourism	----	---	0.56	100.2	----
Ecological reserve	95.0	92.0	523.6	29.7	12.0
Total	**343**	**247,1**	**1430,2**	**189,3**	**20,9**

* Based on crop water requirements

(Source: IUCN Study: Water Demand Management Programme, 2006)

The projected (2010) demand is given in Table 6. The estimates are based on a number of sources.

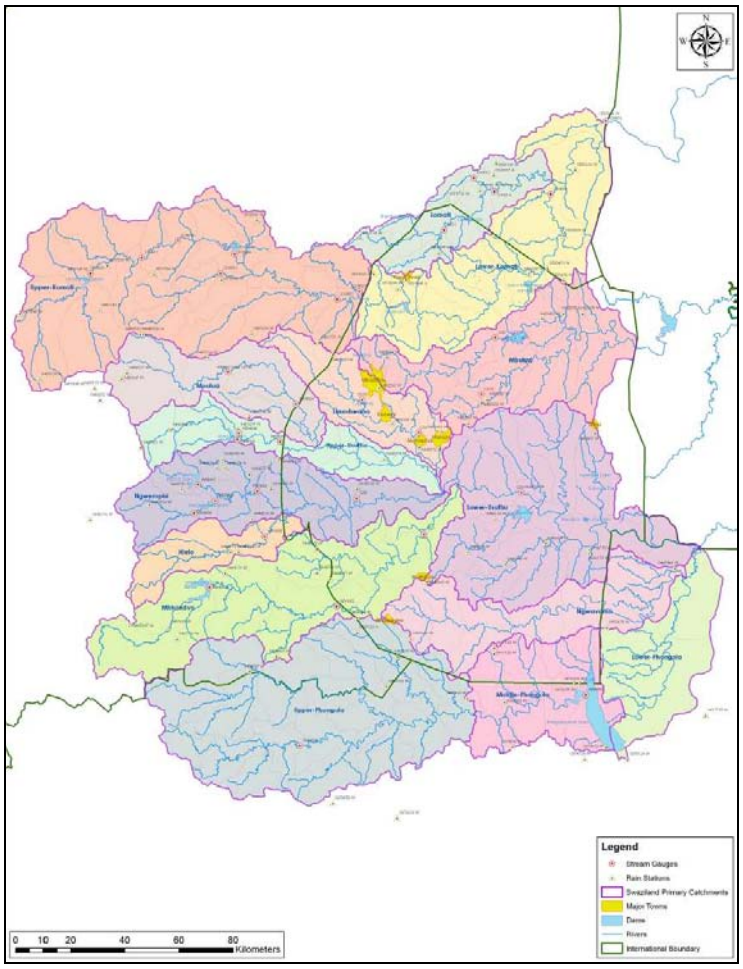
Table 6: Projected (2010) water demand (Mm^3/yr) on major river basins

River basin / Sector	Komati (incl. Lomati)	Mbuluzi	Usutu	Ngwavuma	Pongola
Irrigation*	280	180	400.0	42.0	8.5
Urban domestic	30.0	25.0	30.2	2.1	3.0
Rural domestic			5.11	1.43	
Industry and other (university, schools, etc)			13.35	0	
Livestock			11.32	2.4	
Fishery			0.38	0.07	
Forestry	55.0	0.2	62.963	0.024	0.5
Hydropower	---	---	525.6	23.7	---
Tourism	---	---	0.56	100.2	---
Ecological reserve	95.0	92.0	523.6	29.7	12.0
Total	**460**	**297.2**	**1573.1**	**201.6**	**24**

* Based on crop water requirements

(Source: IUCN Study: Water Demand Management Programme, 2006)

Figure 11: Map of the primary catchments of Swaziland



Source: Swaziland Integrated Water Resources Master Plan (May, 2009)

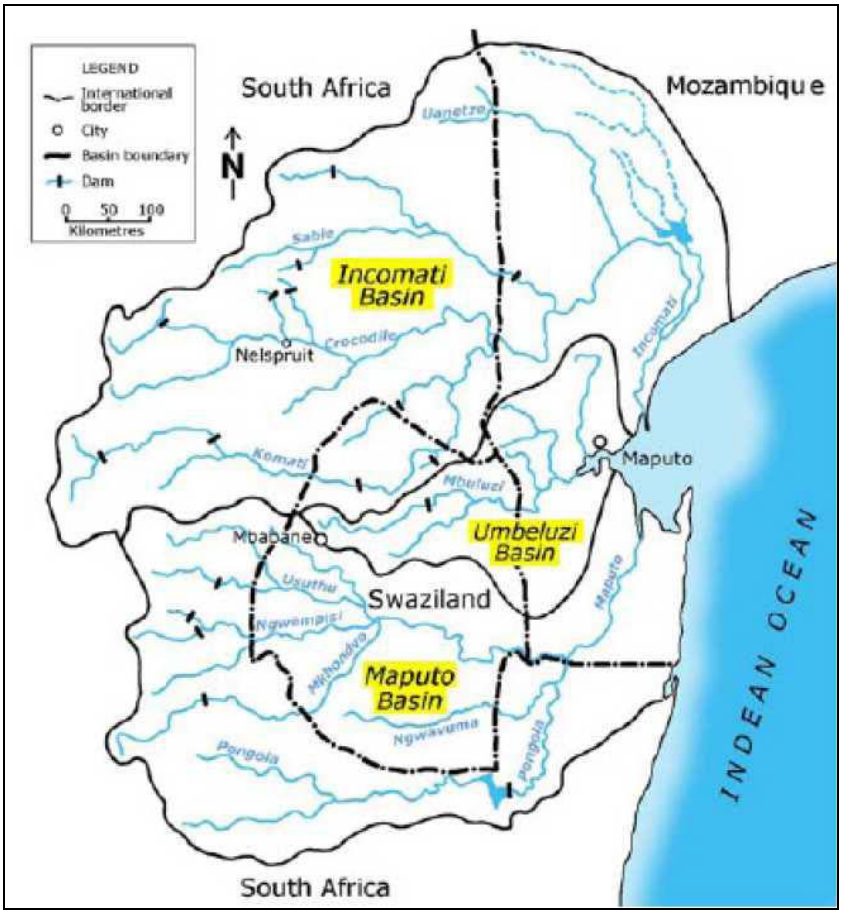
Table 7: Capacity, use, types and characteristics of existing large reservoirs in Swaziland

Name / Properties	Lubovane Dam[9]	Van Eck Dam	Lavumisa Dam	Luphohlo Dam	Maguga Dam	Mnjoli Dam	Mkinkomo Weir	Nyetane Dam	Sand River Dam	Sivunga Dam	Hawane Dam
Capacity (Mm^3)	155	10.4	0.345	23.6 (GSC)	332 (GSC)	153 (GSC)	3.2 (original)	6	50	6.9	2.75
				20 (NSC)	302 (NSC)	131 (NSC)	2.0 (present)		44		
Surface area at FSL (ha)	1,390	124.00	27.22	120.00	1 042.00	1 500.00			590.00	110.00	70
Draws water from	Usuthu River	Usuthu River	Pongolapoort Dam	Lusushwana River	Komati River	Black Mbuluzi River	Lusushwana (Little Usuthu) River	Nyetane River	Komati River	Nyetane and Usuthu Rivers	Mbuluzi River
Height (m)	50	17.9	16.05	45	115	42	15	20	25	13.25	11.5
DWL (m)		1200	580	450	870	1500	400	630	1478	1200	
FSL (m)	224.00	135.88	7.52	1015.8 (masl)	626	294.5			At contour 297.485	129.25	Level (contour) 1 367 (masl)
Max drawdown (m)		120	2	997 (masl)	526	260.5	6 m from spill crest		9.5	119.0	10
Type	Clay core/Rock fill	Rock fill	Earth	Rock fill	Earth /Rock fill	Rock fill	Rock fill	Earth	Earth	Earth	Concrete
Date established	2009	1969	1996	1984	2001	1980	1963	Raised 1992	1965	1972	1984
Use	Irrigation	Irrigation	Irrigation	Power Generation	Irrigation/Domestic /Power generation	Irrigation	Power Generation	Irrigation	Irrigation	Irrigation	Water supply to Mbabane & Ngwenya
Location	26º 10'S	26º 45'S	27º 17'S	26º 22'S	26°06'S	26º 10'S	26° 30'S		26º 00'S	26º 40'S	26° 14'S
	31º 40'E	31º 55'E	31º 51'E	31º 05'E	31°14'E	31º 40'E	31º 18'E		31° 42'E	32º 00'E	31° 05'E
Place	Siphofaneni	Ubombo Sugar (Big Bend)	Lavumisa Border (Golela)	Siphocosini	Nkomanzi (Pigg's Peak)	Dvokolwako (Manzana)	Matsapha	Big Bend	IYSIS Scheme	Ubombo Ranches (Big Bend)	Hawane

* GSC = gross storage capacity; masl = metres above sea level; NSC = net storage capacity; FSL = full supply level; DWL = dam wall length
Source: MNRE, WRB (2006)

9 Lubovane has three dam walls: (i) Mhlatuzane – roller-compacted concrete, 50m high max; (ii) Golome – clay core rock fill, 50m high max; (iii) South saddle – earth embankment, 8m high max.

Figure 12: The portions of the Inkomati, Mbuluzi and Maputo Basins in Swaziland



Source: JIBS (2001)

5.2.1.4 Water use in the sugar sector

The total amount of water available for irrigated agriculture depends upon the rainfall, river flows and the country's storage capacity – with the actual river flow in turn dependent upon catchment management. Water is a critical resource that provides for the financial sustainability of over 50,000 ha of irrigated sugar cane.

The run-of-river water in Swaziland's rivers is fully allocated, predominantly to Title Deed Land (TDL) and to leasehold Swazi Nation Land (SNL) areas. Water supply to SNL is relatively inadequate for irrigation purposes. In order to rectify this imbalance, two major irrigation schemes designed to primarily serve SNL have been initiated. Swaziland and South Africa have combined to finance the Komati Downstream Development Project (KDDP), create the Maguga Dam on the Komati River and share the captured water. The dam will provide water for approximately 5,000 ha of cane within Swaziland. In the centre of Swaziland, a new off-stream dam has been constructed to supply water to up to 11,500 ha of small-scale irrigation developments. The Lubovane Dam, upstream of Big Bend in the southern Lowveld, which will store summer floodwater diverted from the Usuthu River and ultimately irrigate the Lower Usuthu Smallholder Irrigation Project (LUSIP).

5.2.1.5 The Komati Downstream Development Project (KDDP)

The construction of the Maguga Dam on the Komati River south of Pigg's Peak in northern Swaziland has significantly expanded the national capacity for irrigation. Water from the reservoir is shared with South Africa, with Swaziland's share being 40 percent. It is intended to use the water available from the Maguga Dam to develop 6,000 hectares of irrigation on land downstream in the Lowveld that was formerly used for extensive grazing and a small amount of rain-fed cultivation. This will increase the national irrigated area by about 12%.

This expansion is being implemented by the Swaziland Water and Agriculture Development Enterprise (SWADE), a government parastatal company, as part of the Komati Downstream Development Project (KDDP). The currently irrigated land directly benefits 16 farmer organisations comprising around 2,300 homesteads and around 16,000 people. To date around 2,700 ha have been developed, almost entirely for the production of sugar cane. The aim is for the entire irrigated area to continue to be farmed by the small households that were previously engaged in rain-fed farming on the land. To date, some 1,500 ha are under irrigation, principally sprinkler. This is mostly being used for growing sugar cane. Groups of farmers in contiguous areas will form farming associations that will each operate a communal irrigation scheme. These associations elect a management committee to operate most of the scheme as a commercial sugar farm, but individual members have the opportunity to buy water and diversify into other crops on land that they farm near their house. In addition to playing a role in management, association members participate in the production of cane by working as hired labour. Any profits made by the association in the future, after it has repaid its loans for establishing and operating its cane, will be paid to members in the form of dividends, with each member receiving a share.

5.2.1.6 The Lower Usuthu Smallholder Irrigation Project (LUSIP)

The Lower Usuthu Smallholder Irrigation Project (LUSIP) is currently being implemented by SWADE. The LUSIP project will divert seasonal flood flows in the Usuthu River into a reservoir from where water will be distributed by canals to areas to be irrigated. The project intends to develop 11,500 ha of land under irrigation along the west bank of the Lower Usuthu River between Siphofaneni and Big Bend in two phases, expected to be completed by 2015. The project will benefit an estimated 2,618 households (around 23,000 people). It is currently anticipated that 7,000 ha of the available area will be planted to sugar cane for sale to Ubombo Sugar, using those soils that are most suitable. The future of the balance of the land remains uncertain, not least because the final decision rests with the householders who will farm this land.

Figure 13: LUSIP irrigation canal

5.2.1.7 Sugar Cane Irrigation Requirements

Sugar cane is a thirsty crop and in Swaziland requires irrigation all year round to cater for its water requirement. According to the Design Review Report (Coyne et Bellier, 2005) the annual net irrigation consumption of water by cane is calculated to be 1091 mm/yr. This translates to an average annual net irrigation consumption of 0.35 l/s/ha (gross, after 7% canal losses and 75% irrigation efficiency is 0.496 l/s/ha) for 365 days/yr and 24 h/day.

Irrigation systems commonly used in Swaziland for cane farming are drag line sprinklers and centre pivot. Some commercial estates are changing to drip irrigation in order to maximise the efficient use of the available water. Improvements in irrigation efficiencies could be made with a review of existing systems to identify the inefficient areas and identify appropriate irrigation systems to replace existing systems (mostly sprinkler).

Water allocation for sugar irrigation is based on volumetric quantities that vary according to the crop. Cane farming is allocated 13,650 m^3/ha. Application for irrigation water is handled by the respective River Basin Authority in which the activity is to fall. Challenges exist in water allocations due to the limited volume of water that is unallocated. In terms of the Water Act Section 37(9) a permit to divert or use water for agricultural or industrial purposes or for a local authority shall require the permit holder to install and maintain adequate devices to measure and record the flow rate and volume of water diverted or used. The StrEA team is unsure how widespread implementation of this requirement is within the industry as efforts to obtain water use information was hampered by a lack of data.

Table 8: Industry area (ha) by irrigation system type (2009)

Irrigation	Ubombo	Simunye	Mhlume	Total
Centre Pivot	4747.76	2551.86	702.57	8002.19
Flood	524.40		4.16	528.56
Floppy	96.80		196.25	293.05
Furrow 1-5	1252.10			1252.10
Furrow 11-15	465.50			465.50
Furrow 6-10	2383.80	12.69		2396.49
None	27283.90	1039.92	87.60	28411.42
Overhead	484.71	15.00		499.71
Semi Solid-Set Spl	466.40	143.80	977.60	1587.80
Sprinkler (17 mm)	15.00	232.09		247.09
Sprinkler (24 mm)	3845.20	1856.86		5702.06
Sprinkler 1-5	670.70			670.70
Sprinkler 6-10	7377.00			7377.00
SUB-SURFACE DRIP	88.74	41.70	303.80	434.24
Sub-surface drip (1.5 m)	45.40	59.80	22.30	127.50
Surface drip (24 mm)	42.10	591.60		633.70
Furrow		1451.30	7394.13	8845.43
Sprinkler (42 mm)		362.40	1076.50	1438.90
Sub-surface drip (1.8 m)		8611.40	1256.60	9868.00
Sprinkler 11-15			3883.11	3883.11
Total	49789.51	16970.42	15904.62	82664.55

5.2.1.8 The Efficient Use of Irrigation Water

Irrigation water efficiency depends upon the type of crop grown, the degree of cultivation, the efficiency of the irrigation system and the accuracy of measurement of crop water needs. Species vary significantly in their water requirements[10], whilst water consumption can be reduced by using short season varieties. The amount of water pumped is determined by the farmers' measure of the rate of evapotranspiration – the more accurate the measurement the less water applied.

Swaziland's sugar industry is making some effort towards conserving water. This partly reflects an acceptance by the major cane producers that, by having free access to such a scarce and valuable resource, they are in a privileged position and consequently should use the resource responsibly. In the case of RSSC, which has switched a major area of its cane to water-efficient drip irrigation on its Simunye estate, its action is also a response to the fact that it relies upon, and is the major user, of the finite supply of water in the Mnjoli Dam. Consequently it must restrict usage per hectare in order to be in a position to expand plantings. In the other cane areas, water is shared between a larger number of growers of cane and also growers of other crops. There is consequently less incentive for individual cane growers to save water.

10 For example sweet sorghum and tropical sugar beet have significantly lower water requirements than sugar cane.

Although irrigation water is a scarce and valuable resource, it is currently available to users without charge. This was rational in the past when there was enough water for all who had the desire and capacity to irrigate. However, this is no longer the case.

In the production of sugar cane, efficient furrow irrigation uses almost 30% more water per hectare than drip irrigation and, because per-hectare yields are higher under drip irrigation, furrow irrigation uses almost 60 percent more water per kg of sucrose output (Table 9). Thus substantial quantities of water could be saved by shifting from furrow to sprinkler irrigation and especially to drip irrigation. If cane growers were to switch to drip in all areas where such irrigation is feasible, there would be a substantial saving of water that could then be utilised on other crops.

Figure 14: Sprinkler and drip irrigation systems in Swaziland

In broad terms, irrigation efficiency increases from furrow, through dragline/sprinkler, centre pivot and drip. The capital cost of each system is higher but the operating costs are proportionately lower. Which system is used depends largely upon soil type and crop. To put this into perspective, a 10% increase in water efficiency could bring another 7,000 ha of land into irrigated production by 2020. Growing a crop with a lower physiological water requirement could also release water for irrigation and increase the irrigated area. Whilst spreading water over a larger area may not generate the maximum return per hectare, it may spread the benefits more widely amongst the rural population.

Table 9: The water efficiency of sugar production analysed by method of irrigation

Type of irrigation	Efficiency (%)	Water Usage (m^3/ha)	Sucrose Yield (t/ha)	Water Use per Tonne of Sucrose (m^3)
Drip	90	11.11	16.82	0.66
Sprinkler	80	12.50	14.02	0.89
Furrow	70	14.29	13.60	1.05

Source: IWRM Survey and Status Report: Swaziland, 2009.

5.2.2 Expected impacts in absence of the NAS

Expansion of water use for irrigation is constrained by a lack of water storage infrastructure. Run-off river abstraction is reported to be fully allocated in all basins.

In the absence of the NAS with its intended support for an expansion of the smallholder irrigation sector through the KDDP and LUSIP irrigation projects, water demand is likely to increase only marginally unless the Government of Swaziland and other partners construct new water storage infrastructure to store run-off for irrigation.

There are competing demands for the limited water in Swaziland. The bulk of all natural water in the major rivers of the country is allocated to irrigation (96%) and as has been reported elsewhere this water is fully allocated leaving very little available for industry or domestic usage. Transboundary allocations to South Africa and Mozambique are currently upheld and regulated via transboundary agreements.

The IWRM Plan has identified a need to develop new water sources to supplement the current supplies available notably for domestic usage in the major towns and cities. The IWRM Plan recommended raising the Mnjoli dam wall and spillway (which will raise the full supply level by 1.5 m and increase the dam capacity by 22.2 Mm^3) and constructing one or more dams on the Mbuluzi River (Mbuluzi Falls - 14.2 Mm^3/yr), and Mbuluzane River (Mkombane Dam, Mpisi Dam, Khuphuka Dam and Isilele Dam with a total live storage capacity of the proposed dams of 482 Mm^3/yr).

5.2.2.1 Trends in water demand

In general water use information is lacking. Water allocated for irrigation is more closely monitored due to the water abstraction permit requirement but the actual volume of water abstracted/used is poorly monitored and any data or information that is collected is not easily accessible. Water use data based on the water permit allocations is available at a national scale from the Department of Water Affairs. No systematic process is in place to collect or make available the water use by sector, and accurate and reliable data on water use in the different basins is not available. More detailed information and data exists for the large-scale irrigation project areas, e.g. LUSIP and KDDP.

Table 10: Projected Irrigation Water Demand (Mm^3/yr)

Catchment	Year					
	2005	2010	2015	2020	2025	2030
Ngwavuma	47	48	48	48	48	48
Upper Usuthu	40	41	42	43	43	43
Lower Usuthu	269	338	562	562	N/A	564
Mbuluzi	239	N/A	261	N/A	292	N/A
Komati Lomati	225	262	N/A	N/A	N/A	N/A

Source: IWRM Survey and Status Report: Swaziland, 2009.

With the development of irrigation infrastructure through the KDDP and LUSIP schemes, irrigated area is expected to increase until the available water is fully allocated and exploited. Thereafter, little or no additional areas will come under irrigation.

The GoS is investigating two new irrigation projects - one in the vicinity of Lavumisa and another on the Mkhondo River. The combined area increase from the two proposals is not known at this stage but is likely to be several thousands of hectares.

5.2.2.2 Expected effects of climate change on the water regime

The IPCC has published several key reports and assessments on climate change and tried to predict a future state using complex climatic models. Water is involved in all components of the climate system (atmosphere, hydrosphere, cryosphere, land surface and biosphere). Therefore, climate change affects water through a number of mechanisms.

Observed warming over several decades has been linked to changes in the large-scale hydrological cycle. There is significant natural variability – on inter-annual to decadal time-scales – in all components of the hydrological cycle, often masking long-term trends. There is still substantial uncertainty in trends of hydrological variables because of large regional differences, and because of limitations in the spatial and temporal coverage of monitoring networks.

Current national water management practices may not be robust enough to cope with the impacts of climate change on water supply reliability, flood risk, health, agriculture, energy and aquatic ecosystems. In most of the country, existing water management practices cannot satisfactorily cope even with current climate variability, so it is not uncommon for flood and drought conditions to damage infrastructure (pump stations and other abstraction points) and strain water availability. As a first step, improved incorporation of information about current climate variability into water-related management would assist adaptation to longer-term climate change impacts. Climatic and non-climatic factors, such as growth of population and damage potential, would exacerbate problems in the future.

Among the most important drivers of water use are population and economic development, but also changing societal views on the value of water. The latter refers to the prioritisation of domestic and industrial water supply over irrigation water supply and the efficient use of water, including the extended application of water-saving technologies and water pricing.

The dominant non-climate-change-related drivers of future irrigation water use are: the extent of irrigated area, crop type, cropping intensity and irrigation water-use efficiency.

Recognising and accepting the science and predictions of climate change published by the IPCC, climate change may also influence efficiency of the Swazi sugar sector[11]. Sugar cane is a water-intensive crop and its growth is directly related to rainfall, temperature and water availability. All sugar cane in Swaziland is grown under irrigation, thus reducing vulnerability to climate change, but exerting further pressure on available water sources. Also crop growth is closely related to temperature: optimum temperature for sprouting of stem cuttings is 32-38ºC, slowing down below 25ºC, reaching plateau level at 30-34ºC, reduced above 35ºC and practically stopping above 38ºC. However, for ripening temperatures between 12-14ºC are desirable, as it influences the reduction of vegetative growth rate and enrichment of sucrose in cane; at higher temperatures reversion of sucrose into fructose and glucose may occur, leading to less accumulation of sugars.

The presence of pests and changes in their distribution patterns will also change with temperature. For example, smut initiation and spread is high when ambient temperatures are in the range of 25-30ºC; the spread of red not disease is high in the temperature range of 37-40ºC (other conditions being similar); rust incidence is high when minimum temperatures are reduced. Insect pest activity could also be similarly affected by changes in temperature and humidity. Sugar cane productivity and juice quality are influenced by weather conditions during the crop-growth sub-periods. Sugar recovery is highest with low humidity, bright sunshine hours, cooler nights with wide diurnal variations and very little rainfall during the

11 The climate dependencies of sugar cane production and potential effects of climate change is mainly –but not exclusively- based on the document: *Enabling Activities for the Preparation of Jamaica's Second National Communication to the UNFCCC, Vulnerability and Adaptation Assessments Work Package 2: Water Resources and Agriculture, Final Report*.

ripening period. Presence of pests and changes in their patterns will also change with temperature.

In a recent study on the impacts of climate change on sugar cane in Swaziland[12], models have suggested an increase in crop water requirement of between 11% and 14%. With climate change, the combined effect of reduced summer rainfall and increased evapotranspiration rates, results in an increase in average irrigation need of 22–26%.

Figure 15: Stunted sugar cane due to insufficient water

In the case of Swaziland, three main changes are expected: (1) increased flooding in the summer period; (2) increased probability of drought in winter; and (3) moderate decrease in run-off. In addition, mean temperatures are expected to increase 1ºC by 2050 and 2ºC by 2100. Down-scaled studies into the effects of climate change on national water resources are, however, very limited, but those that exist point towards a negative impact on water availability (Matondo *et al*, 2004).

Swaziland has no policy or strategy to address the myriad of issues that arise as a result of a changing climate but it has prepared several sectoral reports on possible effects and adaptive strategies. The country is about to prepare its second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) in which information will be included on: (a) national inventory of anthropogenic emissions by sources and removal by sinks of all greenhouse gases not controlled by the Montreal Protocol; (b) a general description of steps taken or envisaged to implement the Convention; and (c) any other information considered relevant to the achievement of the objective of the Convention. Informing the second National Communication are several sectoral reports prepared by Technical Working Groups which are unavailable at the time of writing.

With the sugar industry so dependent upon water for producing cane and processing it, the effect of any reduction in water availability must be a major concern. The paucity of information on the possible impacts and time frames is resulting in a business-as-usual approach to their water management strategies. Stakeholder consultations have identified climate change effects on water resources as a high priority issue. Several stakeholders

12 J.W. Knox, J.A. Rodríguez Díaz, D.J. Nixon, M. Mkhwanazi, 2010. A preliminary assessment of climate change impacts on sugarcane in Swaziland. Agricultural Systems 103 (2010) 63–72

have suggested that the sugar industry initiate their own research into the possible effects in order to better prepare for a future state that is likely to be different to the present conditions.

5.2.2.3 Effects on water availability from increase in sugar cane farming and climate change

Any additional demand for water for irrigation or cane processing has to come from run-of-river abstractions or purpose built storage systems. Increasing river abstraction will decrease water availability for other users including the environment and transboundary obligations.

As discussed above, all natural river water in all basins has been fully allocated to various uses leaving little available for other uses or increased demands. The predicated effects of climate change including reduced rainfall and run-off will negatively affect existing and future demand and supply.

The GoS has proposed several adaptation measures to increase the security of supply for domestic and industrial use through the construction of more storage dams and the irrigation sector. Recognising the potential impact of decreased water availability at certain times, is also investigating new storage infrastructure. Ubombo Sugar are planning for a new water storage reservoir, RSSC are working with the government on increasing the capacity of the Mnjoli Dam by raising the spill way, and improving their water use efficiencies by installing drip irrigation technologies. Other commercial irrigators are considering constructing more on-farm storage reservoirs to increase their water security.

All these interventions are coming about due to existing water shortages and variability of river flow, which has little to do with long-term climate change induced impacts.

Some stakeholders have suggested that the fact that the water used for irrigation is basically free of any charge (beyond that for abstraction and distribution costs) has led to an industry that is wasteful in its utilisation of the resource and makes little effort to improve water utilisation efficiencies. With a reduction in water availability, all water users need to start investigating ways of improving their utilisation efficiencies to ensure that a significant reduction in waste is achieved.

5.2.2.4 Adequacy of institutional and regulatory framework to respond to challenges

As described previously, water management is the responsibility of the DWA supported by RBAs. Supportive legislative and policy frameworks exist, and if implemented would establish a strong resource management arrangement.

However, from stakeholder consultations and literature reviews, it appears that the good institutional and legislative frameworks are being undermined by a lack of financial, technical and human resources to implement the key mandates and requirements for sustainable water management.

The recent establishment of the RBAs (December 2009) has, on paper, fulfilled the requirements of the Water Act, but with little or no resources being made available to operationalize and support these authorities, there is an increasing likelihood that they will fail in their mandates. Failure to manage the water resource will have untold impacts on the irrigation sector in the future.

5.2.2.5 Effects of future water shortages

As a result of the combined effect of climate change, increased demand for water for industrial and urban supplies, poor monitoring and measurement of the resource and inadequate management interventions and capacity, the future of Swaziland's water resources looks fairly challenged.

Significant resources are dedicated to the utilisation of water for irrigation and cane processing yet resources to sustainably manage the water resources is severely limited.

The direct economic and social impacts of water shortages have not been estimated but from anecdotal evidence from periodic devastating droughts, the cost is likely to be significant exposing existing and emerging farmers to greater economic uncertainty.

Without adequate supplies of water to meet the crop water requirements of cane, yields will decline and profit opportunities will be squeezed. Large established and well-funded multi-national sugar companies could weather the impact by adjusting their irrigation practices with costly interventions. For the small cane grower and other emerging irrigated farmers with fewer resources (human, technical and financial) the impact of water shortages could be economically devastating.

For farmers with access to stored water, i.e. the KDDP and LUSIP growing areas, the impact may be less than for those farmers reliant on run-of-river abstraction. But over time even those relatively water-secure farmers will face increased challenges as dams fail to be replenished by seasonal rain events.

As available water becomes less, it can be expected that abstraction will start to undermine environmental water flows and transboundary obligations. Strong leadership on the part of DWA and RBAs will be needed to manage such crises and ensure the legal requirements emanating from the Water Act and permit holder obligations are upheld.

5.2.3 Expected impacts with implementation of the NAS

The implementation of the NAS in its entirety places additional strain on an already strained resource. Over 15,000 ha of new irrigated areas are expected to be supported by NAS related projects and activities.

The NAS provides small cane growers with an opportunity to get involved in commercial farming of cane. To support this, the GoS and some core partners designed and are implementing appropriate irrigation schemes catering to the need of these rural communities through the provision of irrigation infrastructure and water storage.

Expansion of irrigated farming is limited by water availability in the main rivers. Prior to the development of the KDDP and LUSIP schemes the irrigable potential of the country had already been met leaving very little opportunity for further expansion beyond making efficiency improvements in distribution and application of the water.

The draft IWRM Plan indicates that:

- Future water demands in Swaziland cannot be met by the Mbuluzi and Komati water resources at an acceptable level of reliability.
- The water balance analyses indicate a growing water resources stress and conflict of interest between major water users, notably irrigation in Swaziland and urban water supply in Mozambique.
- Besides the projected water demands and corresponding hydraulic infrastructure, it is important to co-ordinate the operation of dams.
- The construction of proposed dams would only have marginal and local effects to compensate for the losses in terms of evaporation and Instream Flow Requirements (environmental flows) in the Komati and Mbuluzi River Basins. Therefore, it is unlikely that additional water will be available for irrigation expansion, unless drastic measures are taken to improve irrigation water use efficiency and productivity that results in less water used in agriculture without impacting on yield. Hence, water conservation and demand management to achieve large water savings should first focus on irrigation agriculture which is the largest water user in the country.
- There is significant potential for increasing the yield by constructing additional storage reservoirs in the Maputo River Basin portion in Swaziland rather than the other two River Basins.
- As a result of yield stress in the basins, it is important that water use is duly accounted for and measured as far as possible, so that the real change in water demand is compared on a yearly basis with the forecasts and the necessary adjustments are introduced. It is also important that water losses, particularly in irrigation systems and urban water supply systems, are determined so that programmes to increase water use efficiency and reduce overall losses can be prepared and implemented.
- Water conservation and demand management, sustainable efficient agricultural practices, water harvesting, efficient use of groundwater and water reuse should be adopted to manage the increasing water demand.
- If the water balance for the River Basins is adjusted to include the evaporation losses and the instream flow requirements, the adjustment will result in water supply deficits in all basins.
- Hydro-power is treated as a reserve, imposing a restriction on water users upstream of the power generation plant, although the water is available to downstream users. Swaziland's National Water Policy does not address the priority of hydro-power water use.

The currently low performance levels of the DWA and RBAs with respect to managing the available water resource will be further strained through the additional irrigated area expectations. The GoS together with affected stakeholders need to strategise on how to improve the effectiveness of RBAs, WUAs and Irrigation Districts (IDs).

Although the NAS highlights the need for crop diversification, there is little evidence currently that this aspect of the NAS will be achieved in a meaningful manner given the lack of effective institutional and marketing strategies for the possible alternative crops and reluctance from the Development Finance Institutions (DFIs) to extend finance to these other crops. A study has been conducted by RDMU into diversification.

As was noted in the scoping report, the NAS failed to identify water and its management as a potential issue that could adversely affect the viability of all cane growers in the future. No activities or resources have been allocated to strengthening water management structures.

5.2.4 Options to address the key aspect

From the consultations and review of available literature, the increasing threat of climate change not only on water resources but on all aspects of cane production including increases in crop water requirements brought about by increasing temperatures and evaporative demands, requires an urgent and meaningful assessment. Even excluding the effects of climate change on water availability, the country is already facing severe challenges in meeting its water requirements due to increasing use of available water for non-irrigation purposes, i.e. domestic and industrial consumption.

There are several options available to address the water and climate change issue:

- The irrigation sector is highly exposed to climate change so it imperative that urgent action is taken to identify impacts and relevant adaptation strategies, through undertaking a **climate change impact assessment** of the irrigation sector. If the effect and predicted impacts of climate change on water resources are correct, then detailed assessments of the significance, scale and scope of the impact need to be investigated and mitigation strategies formulated to ensure the sector continues to provide its multitude of socio-economic benefits.
- Undertake an evaluation of hydrological data systems to **identify the gaps in information and measurement**. The paucity of accurate and reliable information on the availability of water within the basins is a significant challenge to managing the resource in a sustainable and equitable manner. Flow measurement and abstraction rates are not fully understood and resources are needed to improve this knowledge gap to enable technically sound management decisions can be made on allocations.
- Investigate ways to **encourage irrigators to use water more efficiently** through changes in their irrigation equipment and practices (surface to sprinkler to drip), improvements in the distribution of water (line unlined canals), improvements in the scheduling of irrigation with site specific recommendations and assist RBAs and the DWA with improving their flow measurement structures, reporting and data collection.
- Assistance is required to help the RBAs develop **basin management plans** that will provide information on sustainable water allocation, which in turn will help the overall water management expectations of FAs and large schemes. The lack of basin management plans and detailed technical assessments of water availability means that water permits may not be issued.
- RBAs need to **review the draft IWRM Plan** to ensure relevance and appropriateness of the plan to their mandated responsibilities.
- Dam owners or operators to assess the scope to increase water storage to accommodate climate change seasonal variations.
- The GoS, RBAs and others to support where possible **greater use of on-farm water storage structures** to increase water security on the farm.
- In light of decreasing river yields and increasing water demand, **strategies for increasing water use efficiencies** must be developed by all water users. RBAs and others need to increase water users' awareness of the importance of water efficiencies and the methodologies to achieve water savings.

– Water use for irrigation is linked to crop water requirements. Diversification in crops can help reduce water demand; however, there is currently low emphasis on diversification; irrigation consumes about 96% of the country's water yet access to clean safe water by communities is very low; climate change will exaggerate the need for community water supplies that may threaten the business-as-usual arrangement for allocations.

5.3 Key aspect 2: Long-term social and environmental sustainability of small-cane growers (High Priority)

5.3.1 Current state

The sugar industry plays a crucial role in the overall economic development of the country, in terms of total agricultural and manufacturing output, employment of workers, and the multiplier effects of linkages with other sectors and the development of support activities, which in turn contributes to poverty alleviation and food security. The viability of the industry is thus vital to the economy of the country, and to the well-being of the people. A key component of the NAS is the financial and technical support for the expansion of sugar cane cultivation by small cane growers.

A number of small- and medium-cane growers have, over time, established themselves, operating as individuals or as a group in co-operatives and farmers' associations. Through the construction of Maguga Dam in Swaziland and Lake Matsamo (Driekoppies Dam) in South Africa, the Komati Basin Water Authority (KOBWA) improved the assurance of water supply to existing and emerging irrigators downstream of the dams, such as in the KDDP. Likewise, further expansion of irrigation schemes was created through LUSIP and the Lavumisa Irrigation Development Project.

The first phase of LUSIP Project has involved the construction of a weir, feeder canal, Lubovane dam, and a canal-based distribution system. On-farm works are progressing, with plans to irrigate an area of approximately 6,500 ha, benefiting an estimated 2,618 households with the creation of 75 agricultural businesses[13]. The government intends to start the expansion of the Project into Phase 2, extending the water delivery system to irrigate up to a further 5,000 ha for cane growing[14].

It is also anticipated that a total of 7,400 ha of irrigated farms will be developed as part of the KDDP; 5,500 ha of sugar cane and 1,900 ha of fruit and vegetables, with an estimated 29 FAs and 14,500 direct participants. To date, approximately 3,700 ha of production land has been planted to sugar cane and 350 ha to diversified agricultural production[15].

The Lavumisa Irrigation Development Project Phase I had a total of 234 ha under cane by 2008, with 91 ha of other crops grown by a local co-operative. Long-term objectives include sugar cane expansion by 50 ha, and improved management of 184 ha ratoon crop.

The KDDP, LUSIP and Lavumisa projects, implemented by SWADE, aim to transform the local economy from subsistence farming into sustainable commercial agriculture, and thus

13 www.swade.co.sz, and a SWADE pamphlet: Lower Usuthu Smallholder Irrigation Project: From Subsistence Farming to Commercial Agriculture.

14 Funds for LUSIP 2 can only be allocated from the 2011 Annual Action Programme (AAP), thus the earliest date to be able to enter into individual contractual commitments will be January 2012.

15 www.swade.co.sz

contribute to poverty alleviation. Direct beneficiaries are, and will be, local farming communities. For example, according to SWADE, based on a Socio-Economic Survey conducted for LUSIP in 2005, by 2015 household food security for direct irrigation beneficiaries is set to improve from 41 to 100%, and the income of households will increase by at least 300%, from an estimated monthly average of E980.00. In addition, an even larger population are expected to derive indirect benefits, through expansion of wage employment and small enterprise opportunities arising from an increase in cash turnover in the local economy.

In reality, however, there is cause for concern. Coupled with the price reduction by the EU and volatility with the € and South Africa Rand, sugar cane growers have generally experienced decreases in profitability of cane production over the last few years. Although the price paid to sugar cane growers by the Swaziland Sugar Association (SSA) rose from near E1,200 per tonne sucrose (TS) in 2004 to near E1,800 TS in 2008 (RDMU, 2009j), profitability margins have generally decreased. The margin decline can be attributed to increasing input prices, such as for fertiliser, and increasing operational expenditure, such as transport and electricity. Costs are surpassing revenue, and growers are finding it difficult to adequately service their loans. Spiralling into debt, farmers are struggling to remain in the sugar cane industry. Combined with these financial issues are the broader and indiscriminate environmental impacts. Stakeholders have already identified water availability and climate change as being very likely to adversely affect cane production (See Key Aspect 1). These environmental challenges will further compound small cane grower problems particularly if irrigation requirements are unable to be met consistently. Also drought will adversely affect sucrose yields thus decreasing small cane growers' revenue.

Many studies have been undertaken to ascertain problems facing cane growers. For example, in an analysis of the performance of individual smallholder cane growers carried out by the RDMU in 2009, a decline in yields was attributed to factors "that are within the growers' control, such as poor crop husbandry and pump failures …. to those the grower has no control over, like escalation of input prices and lack of irrigation water due to drought"[16].

Performance of the small cane growers is affected in varying degrees by a range of variables[17]. In a study undertaken by the RDMU amongst small cane growers, it was found that "the economic situation is most critical for growers that have planted a high percentage of their area to sugar cane, those with low levels of productivity and a high capital investment" (RDMU, 2009j) [18]. However, there are very much few alternative crops that can provide much higher and sustained income compared to sugar.

Discussions with stakeholders have revealed a host of factors that people believe may contribute (or in some instances have already contributed) to the failure of small- and medium-cane growers. These include:

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16 RDMU (2009e) - *Baseline Study Report (Individual Growers)*, which focused on gaining an insight on the cropping patterns, yields of cane and other crops, irrigation equipment, loan obligations, labour availability and service support extended to FAs, with the aim of identifying areas where interventions are needed, and measure the impact of the proposed EU and NAS interventions.

17 These include, for example: the size of the cane acreage through limited economies of scale; the number of shareholders relative to the farm size; crop husbandry practices; the level of yields; the degree of specialisation or dependence on cane production; capital investment and loan repayments/indebtedness; business model (as an individual or a member of a FA); management and technical capacity; labour availability; and distance from water resources and mills.

18 The study reflects that over the previous three years there had been a significant decline in yields owing to a number of factors. These range from those that are within the growers' control e.g. poor crop husbandry and pump failures right up to those the grower has no control over like escalation of input prices and lack of irrigation water due to drought. This situation affected the ability of the growers to adequately service their loans and also declare a dividend to their members. Despite the above conditions, growers are still determined to remain in sugar cane farming as it still seems attractive compared with other cash crops and also given their massive investment.

- Farmer Association Business Model. The model is used in both KDDP and LUSIP in which farmers are required to pool together their land parcels into a group, and be given an equal share in the association (despite the original land size not being the same for each member). The following points have been raised against the model:
    - The shareholding of the members not equated to the amount of land contributed by the respective farmer ('pool' land for reallocation based on equal share);
    - Lack of choice as to who forms the FA, given that it is based on the location of the landholding (farmers cannot choose with whom to associate in the group, there may not be good 'neighbourliness' and conflicts may arise);
    - Problems in employer/employee relationships given the confusion of the roles of being an employee of the association and a shareholder at the same time;
    - The need for the FA to be run much like a business, requiring an effective management body and the employment of skilled and un-skilled people, rather than a developmental poverty alleviation scheme.
- Increasing Farmer Indebtedness. Farmers often take loans for the initial capital investment into the installation of irrigation equipment and for annual ratoon management. The poor performance of the FAs and high interest rates means that almost the entire sucrose proceeds are taken by the financier to cover the loan instalment. This creates a vicious cycle whereby the FAs find themselves requiring financial backing to keep their farm sustainable. The non-sharing of dividends amongst the members in the project despite the high capital outlay become a major demotivating factor for the farmers. This challenge may force some FAs out of cane production.
- Tax requirements. These are placing an additional financial burden on farmers and again impacting on profits.
- Unrealistic Business Plans. The initial business plans for smallholder developments did not factor in realistic projections on the increase in costs, such as for electricity and fuel, both in the medium- and long-term. Over and above all, the current business plans do not cater for provision of replacements. Linked to this are weak financial management systems and procedures, resulting in little control over income and expenditure.
- High Input Costs. The running costs, particularly for energy and transport, depend largely on distance, either from the water source (electricity required for pumping), or to the sugar mill (haulage for the cane). Equipment in use by smallholders is allegedly energy-inefficient, adding to electricity costs. As with the price of fuel, the price of electricity has increased substantially, and Swaziland's dependency on electricity from South Africa generates uncertainty around price stability. Many smallholders have not taken up the Time of Use Tariff offered by the Swaziland Electricity Company (SEC) to optimise their energy usage during off-peak periods. This is in part due to the nature of irrigation – irrigation can take place 24 hours a day.
- The lack of Technical Capacity and Training. This is not only for irrigated farming (and sugar as a cash crop), but for irrigation and business management, required on a broad level and not only for particular individuals. The use of various trainers following their own training programmes has led to some confusion within FAs.
- Limited Extension Support Service. This is provided by the MOA, SWADE and the sugar mills. Although the extension service is perceived to be of good quality; it is not

sufficient to cover all the farmers and their associated requirements, and results take time (such as for testing the mercury level in soils).

- Over-dependence on Out-sourced Services. This has its own set of practical problems. For example, the contracted hauler may fail to deliver the cane to the mill on the set time (e.g. the truck breaks down en route to the mill) hence causing the deterioration of the sucrose content before the cane reaches the mill.
- Maintenance of Farm Equipment. This can be a result of lack of financial resources, technical know-how, or the use of unsuitable parts).
- Inadequate Supportive Infrastructure. This includes inadequate holding dams (balancing dams contain only small volumes) and poor roads.
- Lack of Water. This is mainly caused by drought and by upstream overuse of rivers or canals.
- Insecure Land Rights. At issue is the inability of land tenure arrangements to use SNL as collateral for loans. Landholding and chieftaincy disputes are also presenting stumbling blocks to cane development. An addition, as farmers do not own the land, and under traditional land tenure arrangements chiefs have the power to withdraw land rights, although seldom applied the risk of losing land is a deterrent to productivity-enhancing investments; farmers may be inhibited from investing in their land for fear of losing it.
- Alternative Crops. With the use of vast tracts of land for the growth of sugar cane, limited availability of land for the production of other crops, and for the grazing of livestock[19].
- HIV/AIDS Impact. The negative effect of HIV/AIDS on labour availability and productivity is addressed under Key Aspect 4.

The agriculture sector of Swaziland has historically been subsistence, thus a change to a cash-based system holds an element of risk (or opportunity), on an economic, social and cultural level. Emerging cane growers and developers alike are concerned at the high risks associated with irrigated agriculture, and particularly for sugar cane. Failure may tip the fine balance between success or failure, and having moved primarily to a cash economy, the safety net provided by subsistence and a more traditional way of life has been reduced[20]. Ironically what is seen as a poverty alleviation project may in itself lead to poverty and high levels of indebtedness. However, despite the difficult conditions facing cane growers, farmers remain optimistic within the sugar cane industry as “it still seems attractive compared with other cash crops”.

19 However, most of the alternative crops to cane cannot attract funding. For example, the NAS provides that the new entrant growers can diversify 25% of their land to other crops, but this has not been successful because of viability issues.

20 In the past, traditional cultural practices ensured that a social safety net was provided to the needy; support structures cushioned society from the effects of poverty. At the family and neighbourhood level resources were shared; at community level the chief catered for the needy, drawing on surplus harvest and donations or gifts. Today, however, the extended family is weaker due to urbanisation, migration and the affects of HIV/AIDS; for the traditional indlunkhulu system, resources have diminished. (www.unep.org)

5.3.2 Expected impacts in absence of the NAS

Swaziland has been facing high levels of poverty and food insecurity; the country has one of the highest scores on the Human Poverty Index (HPI-1) (53.9%)[21]. Poverty has apparently become more pronounced in recent years; present estimates are that 69% of the population lives below the poverty line of E57.00 and E104.00 per month for rural and urban areas respectively[22]. This can be attributed to: (a) persistent drought that has caused famine in many rural communities, especially in the eastern Lowveld and Lubombo Plateau; (b) the loss of income earnings through retrenchments and general unemployment, contributing to the lack of access to productive resources by the poor; and (c) HIV/AIDS, which has intensified poverty due to the loss of earnings from breadwinners in families.

According to the Swaziland Vulnerability Assessment Committee (Swazi VAC, 2009)[23]:

- an improved rainfall season will enhance agricultural production, with a reduced number of households having a food deficit;
- a decline in the rate of consumer inflation will improve households' access to food, despite diminishing income opportunities due to increased unemployment levels, primarily as a result of the global financial crisis and reduced migrant work in South Africa;
- however, the dependence on rain-fed agriculture "is no longer a viable option for a sector that is considered a livelihood source for a significant proportion of the population"; and
- in the midst of food insecurity, the country has been concentrating efforts in fighting HIV/AIDS, and the emergence of other health-related epidemics (such as cholera) pose a challenge to the health care system.

The VAC highlights the need to ensure that efforts on improving livelihoods are focussed where the need is greatest, and that "streamlining interventions by the various role-players is essential to maximise utilisation of the available resources".

In the sugar industry, in the absence of the NAS the long-term sustainability of small- and medium-cane growers will be based on support that can be provided by the government, mainly through the MOA, SWADE, sugar mills, the SSA, and the private sugar companies. There will be a heightened risk of increasing poverty levels and decreasing food security if problems experienced in the shift from subsistence farming to the introduction of commercial sugar cane production escalate, influenced primarily by financial and technical difficulties.

Little legislation deals directly with poverty alleviation and food security, and issues related to the viability of small-scale farmers[24]. Rather, the GoS has produced a set of related policies (see Annex 4).

A multi-sector Poverty Reduction Task Force (PRTF) was set up by the MEPD in response to the results of the Swaziland Household Income and Expenditure Survey (SHIES) in 1997,

21 www.undp.org

22 www.unep.org

23 Established in 2002, the aim of Swazi VAC is for an analysis of livelihoods in development and emergency programming, for input into policy decision-making at government level, for local UN Agencies, and for NGOs.

24 Legislation that broadly speaking may be of relevance include: labour legislation; legislation related to the formation of companies; the Public Health Bill (1999); the Electricity Act and the Swaziland Electricity Company Act (both 2007); and the Water Act (2003).

which revealed that 66% of the population lived below an income poverty line (E70.00 per month), and 48% lived below a food poverty line (E48.00 per month) (MEPD, 2004). Membership of the PRTF ranges from the MEPD (which has a Poverty Reduction Unit (PRU)) and the Ministry of Finance to the social service ministries of Health, Agriculture and Education.

The government has obtained assistance in alleviating levels of poverty within the country from international bodies such as the World Food Programme (WFP) and UNDP.

Whilst the country appears to have a comprehensive policy and legislative framework, reports from stakeholders suggest the lack of implementation of these policies and particularly in a coordinated and targeted fashion, is adversely affecting efforts to improve the socio-economic status of much of the population. National budgetary constraints and grand capital projects are adversely affecting government's ability to intervene in a consistent and beneficial manner.

The LUSIP and KDDP projects are being implemented in isolation from other national activities and there appears to be a disconnection between what is taking place within the project areas and what is urgently needed in the wider community. Expected interventions that should have spill-over impacts on communities, like improved health care facilities, schools and other social services, are not impacting on communities outside these project areas. Islands of development are appearing within areas of abject poverty.

5.3.3 Expected impacts with implementation of the NAS

A number of NAS measures are expected to improve the viability of sugar cane growers:

- Competitiveness of the sugar cane industry includes improved national infrastructure, given the high costs of hauling and transporting cane to the mills: reduce the cost of public utilities to the mill estates and improve general industry productivity and efficiency.
- Promoting productivity and efficiency in smallholder cane growing, through:
    - o stabilisation of the financial situation of smallholder cane growers. This entails supporting the existing growers improve farm operations through interventions to provide technical and business management capacity (e.g. crop husbandry, irrigation scheduling and financial management), rehabilitation of irrigation systems design flaws (to meet crop water requirement and reduce electricity cost), provision of irrigation equipment for new cane development to alleviate the initial investment cost for the growers, improving bulk water supply (to assure water availability and meet crop water requirement), ratoon management financing (timely access to finance), and central bulk input procurement (reduce the unit cost of inputs through economies of scale).
    - o re-examination of the viability of the smallholder cane grower component of LUSIP and KDDP, to minimise risk of financial difficulties, through financial, management and skills audits; and
    - o rationalisation of smallholder association management, to avert problems of coordination between smallholder management and mill requirements which have led to a decline in yields through, for example: stabilising the financial situation of the cane growers (e.g. rescheduling of loans and reducing interest rates); designing a financing/lending model for smallholder farming to be used by financial institutions; re-examining (with a view to improving) management training programmes presently provided to sugar cane farmer associations,

including a needs assessment of the training required; improving cane production yields and sucrose content by an increased use of fertilisers and agrochemicals, and the expansion of cane farming into virgin land; and, providing a capacity building programme to SWADE and SSA extension services, also requiring a needs assessment.

- Diversification within and outside of the sugar industry, including the growing and marketing of crops other than sugar cane, strengthening agricultural research and extension, and diversification into other industries. All require intensive research and investigation.
- Enhancing a sustainable socio-economic environment, and cross-cutting issues, such as:
    - Improving access and security of tenure on land, given that access to land is regulated and limited and therefore not easy to use as a means to support income generation, nor is it possible to use SNL as collateral for loans. Consultation with the MOA and relevant traditional leaders is required to ensure full concessional/grant financing of LUSIP.
    - Providing grant financing of LUSIP, recognising that the sugar reforms have put LUSIP at risk and financing is required to ensure its viability.
    - Empowerment of the poor to generate income, through expansion and improvement in the quality of national schooling and technical training in consultation with the Ministry of Education, and accessing credit for business and agricultural purposes through the Poverty Fund, developed by the MEPD.
    - Pursuit of good governance, such as through the training of communities on the utilisation of Poverty Funds to support coping and diversification, including entry into the sugar industry, by implementing relevant portions of the Poverty Reduction Strategy and Action Plan.

Recognising the problems facing the viability and sustainability of smallholder sugar cane growers, the RDMU is undertaking a number of activities relating to the NAS measures. The SSA is also implementing a Smallholder Assistance Action Programme largely based on implementation of the NAS, with input from and actions involving relevant stakeholders.

Of relevance are the following objectives, each with actions for implementation[25]:

Objective 1: Reduce the debt burden of smallholder farmers and make loans repayable

Develop a programme to assist in reducing the rate of interest and/or obtain grant funding from government (including the possibility of using a sugar levy):

The programme to reduce interest rates has followed two approaches: the first, to re-schedule the loans; the second, to reduce the interest rates. Apparently, according to the SSA, there has been success in re-scheduling most of the loans. To date, although some Development Finance Institutions (DFIs) did agree to reduce the interest rates for existing farmers, generally the interest rates remain high, averaging around 15%[26]. The DFIs state that they are charged prime by most of their sources of

25 Information is taken mostly from an SSA paper entitled: Smallholder Assistance Action Programme: Towards Enhanced Viability and Sustainability of Smallholder Sugarcane Growing.

26 Interest rates go up to 18%; rates vary depending on the DFI. The interest rate that is used in business plans for new FAs applying for the EC grant is 15%.

funds, and they then have to mark up the interest rates to cater for management and administrative costs.

The government has provided a facility to rebate several farmers at KDDP for some of the funds loaned by financiers towards land development and water conveyance from source to field edge. Modalities for determining the rebate due, and for distributing/managing the funds, are being finalised by the industry.

On a sugar levy, the SSA successfully negotiated that the levy be stopped given that the Sugar Protocol had expired. The government agreed to stop it as of 1 October 2009. The SSA itself does not impose any levy.

***Re-schedule existing loans by extending the repayment period*:**

Some DFIs have reduced their interest rates, and repayment periods have been extended for the highly indebted growers for 7-15 years.

The operations and modalities of a Ratoon Management Fund (RMF) is being finalised, to facilitate the timely sourcing and distribution of cheaper funds to sugar cane growers during periods when funds are needed – e.g. for fertiliser after harvesting prior to being paid by the mill.

***Set up a facility for the financing of development costs (land clearing, supply and installation of irrigation infrastructure) at concessionary rates*:**

Through the EC Accompanying Measures (ECAM) new smallholder sugar cane growers will have up to 70% of their development costs grant-financed[27]. To be eligible, growers need to meet the following criteria[28]: be part of a FA, with land-holding not exceeding 3.5 ha per household; reasonable representation of women and vulnerable groups; financially viable and sustainable Business Plan; Chief's letter of consent; water abstraction rights and a sucrose quota; Environment Mitigation Plan; undertaking to maintain in proper condition the irrigation equipment; evidence to finance the remaining 30% of the total development cost (for seed-cane planting and cane establishment).

EC Round 1: Eight FAs (with 379 members) were approved for an area covering 630 ha; seven FAs (200 members) in LUSIP (397 ha), and one (179 members) in KDDP (233 ha). In all areas, land development and irrigation installation works are ongoing, with seed-cane being expected to be planted in LUSIP.

EC Round 2: The Business Plans of 11 FAs (with 550 members) have been approved by the NAS Evaluation Committee as eligible for EC funding, covering an area of 865.4 ha; eight FAs (337 members) in LUSIP (484.8 ha), two FAs (93 members) in KDDP (140.6 ha), and one FA (120 members) in Hlane (240 ha).

EC Round 3: The Business Plans of 10 FAs (with 463 members) have been approved by the NAS Evaluation Committee as eligible for EC funding, covering an area of 646.6 ha; eight FAs (395 members) in LUSIP (542.2 ha), and two FAs (68 members) in KDDP (104.4 ha).

Existing growers will be assisted through rehabilitation of irrigation equipment design flaws, and with procurement of seed-cane for replanting.

These interventions should help farmers generate sufficient surplus funds to share

27 As part of the Multi-Annual Action Plan (MIP) 2007-2010. See: European Union (2009).

28 RDMU. National Adaptation Strategy Newsletter. Issue 1 2010.

as dividends, to provide incentives for loan repayments.

Assist in the maintenance of irrigation equipment:

Extensive and expensive equipment has been installed to support smallholder irrigation projects, and requires maintenance by local users. Optimal upkeep of the irrigation infrastructure is important to maintain distribution and application efficiencies, but is costly.

RDMU assists in the repairs of irrigation systems' design flaws and the capacity to manage the equipment. Current Business Plans require that the farmers set aside a requisite budget for the maintenance of irrigation equipment[29].

Establish a conditional debt relief facility for farmers who are not viable, who are considering exiting and/or diversifying from sugar cane:

Diversification initiatives have been considered. In support of the NAS, a study on an Exit Strategy was undertaken to determine the cost of exiting sugar cane production by growers at an uneconomical distance from sugar mills, to replace cane with alternative crops[30].

Options to support diversification and a move to other crops were presented in RDMU's report on an exit strategy. These included:

- **financial support to change from cane to other crops, including grant payments for cane eradication;**
- **establishing a system/institution that provides technical advice/training on crops other than sugar;**
- **supporting research into irrigated crop production e.g. at Malkerns Research Station;**
- **improving marketing research and structures for other strategic crops e.g. dry beans, maize, and vegetables;**
- **financial support in establishing processing, cold storage and packaging plants for vegetables; and**
- **supporting infrastructure improvements e.g. canals, water storage facilities, and irrigation infrastructure.**

Farmers would thus be directly assisted with the cost of eradicating the cane, land preparation and the provision of seed. Under the SCGA grant contract, provision is made for such initiatives; a survey to ascertain interest from the target group and the area involved is set to be undertaken.

The benefits of diversification may include: non-dependence on one crop; that gross margins may be higher than for sugar, particularly if not affected by high transport costs; and that growing subsistence crops/vegetables may serve as a safety net in times of difficulty (such as during drought). Disadvantages include: the opportunity cost of lost income from cane growing; the change induces costs, for cane eradication, to prepare the land and plant an alternative crop, to adapt the irrigation system, to acquire machinery/equipment, and to redeploy/train labour or terminate

29 The SSA has indicated that LUSIP and KDDP schemes may introduce levies for the FAs to cover operation and maintenance costs.

30 RDMU (2009j)

contracts; in practical terms there is irreversibility in moving out of sugar; there are marketing risks, with no ready mill at hand to buy the crops; volatility of prices; lack of institutional support: little/no technical/extension/outgrowers support; the financial situation of highly indebted farmers would have to be resolved; and, difficulty in obtaining a bank loan/credit.

Objective 2: Improve productivity and reduce production costs in smallholder farms

Enhance farmer training to improve productivity and address financial risk on sugar cane growers, seek external support to increase/improve training, and establish a common forum where training issues will be discussed between service providers:

A Farm Management Structure for new growers has been developed and agreed on by NAS stakeholders. This requires that FAs employ a professional manager to oversee the technical and administrative operation of the farms, and a Board of Directors established to play a strategic role in supporting the overall goals/vision of the FA. These will be coordinated through the Millers Outgrowers Departments.

SHIP, in collaboration with SWADE and the Millers Outgrowers Departments, is tasked to provide training for sugar cane growers to improve farm management practices, including: capacity building in irrigation equipment, management and maintenance; irrigation scheduling; crop husbandry practices; and corporate governance. As part of this, SHIP is developing a needs assessment to ascertain growers' training needs.

Although collaboration exists on-the-ground to some extent, a common forum of training service providers (SWADE, SSA, SHIP, Millers and the MOA) is recommended, for greater co-ordination. In addition there is a drive by the Ministry of Commerce, Industry and Trade and the parastatal organisation, Swaziland Enterprise Development Company (SEDCO) for the government to establish a formal database of recognised service providers who could offer a supportive role in the training, such as SEDCO.

Improve land tenure systems on farms:

The issue of land has been addressed in the Draft National Land Policy (NLP) (1999), prepared with a view to improving access to land and security of tenure on Swazi National Land (SNL), including tenure on irrigation schemes, and clarifying roles and responsibilities for land administration. The possibility of leasehold arrangements and transferable user rights for individual farmers and farmer groups on SNL are considered, proposing that the 99-year leasehold concept, already being applied on SNL by the Ministry of Housing and Urban Development (MoHUD) in an urban context, be applied to rural SNL. The Draft also proposes changes to systems of land allocation to allow women to have equal access. Further development of the NLP was temporarily suspended pending the finalisation of the Constitution. There have been recent developments in finalising the draft but no public announcements.

The National Rural Resettlement Policy (NRRP) (2002) also addresses land issues. Not limited to resettlement, it sets out a wide-ranging policy framework on the improvement and planning of land use. The vision of the Policy looks towards defining an overall framework for sustainable land management in rural Swaziland, focusing on the goal of improving land use in rural areas in order to enhance sustainable livelihoods.

The SSA considers land as an ongoing issue for consideration.

Reduce electricity costs by adopting a more flexible tariff structure, and using energy-saving methods and practices: **The SEC approved a tariff for growers using pumps with not more than 100 KVA capacity, intended to reduce energy cost for farmers. Most FAs are not able to benefit from this as their pumps exceed the threshold. Others are not aware of the SEC's Time of Use Tariff.** **A task team coordinated by the SSA has been established to engage the SEC on the optimisation of tariff structures. In addition, educating farmers on energy saving is part of SSA extension service training, in which the SEC covers electricity-saving tips for growers.**
Develop road and bridge infrastructure so as to reduce transport costs and investigate options to provide a transport subsidy for farmers outside a certain radius: **Financed under the ECAM, the Siphofaneni-St Phillips-Maphobeni Road, Siphofaneni Bridge, Mananga-Sihhoye Road, and Dvokolwako Bridge Road are being upgraded. Other road improvements will be included in the 2011-2013 MIP, based on a Cost-Benefit Analysis (CBA) to be commissioned by the RDMU. The project will also look at the improvement of infield roads, to reduce maintenance costs to growers.** **The Ministry of Public Works and Transport has developed a road maintenance plan, which will cover the new roads/bridges under the NAS.** **The Millers provide, at their own discretion, transport subsidies to long distance growers.**
Enhance the contribution of women as smallholder sugar farmers: **A key issue relating to the NAS is gender mainstreaming, gender equity and gender empowerment. The RDMU commissioned a report considering this, which recommended gender mainstreaming to ensure that the essential needs and priorities of women are incorporated in the design, implementation and monitoring of all programmes[31].** **Women are usually affected in terms of their inequitable power relations with men, resulting in deprivation in terms of access and control over resources and workload sharing. Greater income through sugar cane production should enhance women's status and capacity to access and control services and assets; traditionally this will impact on power relations within the family. On the other hand, the situation will improve the quality of life of families as women are likely to spend a significant proportion of the additional income on the welfare of the whole family. Participation in FAs will improve the capacity of men and women to engage in development issues and bring positive transformation.**
***Prevent/reduce social conflicts*:** **Through training, enhance positive contributions from traditional authorities; designate areas for development.**

31 RDMU (2008e).

The United Nations Conference on Trade and Development (UNCTAD) reiterated some of the above points, outlining recommended policies for small-scale sugar cane growers in Swaziland[32]:

1. Present land tenure policies and legislation should be reviewed to facilitate commercial farming on SNL, as stated in the National Development Strategy (NDS).
2. The government should review ways of providing loans guaranteed for small-scale sugar farmers.
3. Measures, including legislation, need be considered to ensure that FAs are legally constituted.
4. The taxability of income from commercial farming on SNL is to be clarified.
5. The MOA should consider monitoring yields; any field that does not meet an agreed minimum reference yield should be investigated on the grounds of "wasting a national resource".
6. Establishment of a development fund, administered by the industry, to assist new small-scale participants.
7. Growers to be ensured of receiving the required amount/type of extension services.
8. Improved training to trainers and growers, in all aspects of cane-growing and in support services, such as in money management, loan applications, administration and bookkeeping.
9. Funding for small/medium enterprises is required to provide support services to growers, such as for machinery pools, haulage contractors, land developers, farming contractors, and management services.

The NAS actions taken to date address some of the key issues: around long-term sustainability through financial support, support in the provision of infrastructure, capacity building and training, extension services, and options around diversification. However, there seems to be a key problem in the viability of small cane growers: the management model selected for implementation, which in turn affects financial success and profitability, and thus concerns around food security and poverty.

If appropriate and proficient management of the FAs was established, and the 'business' ran successfully, there might be lesser concern around issues such as high interest rates, costs and tax. Concentration on getting the model right, in agreement with the participants is a top priority. Thereafter the long-term sustainability can be assured through some of the issues currently addressed by stakeholders in the sugar industry, particularly in relation to NAS: reducing the debt burden through the provision of grants, rescheduling loans, or establishing funds; assisting in the development of business plans, including financial management; negotiating with relevant bodies around relief in the high costs of services; providing support in the form of infrastructure, extension services and training; and mainstreaming gender to ensure participation of women.

Until the core issue is addressed, all NAS actions will not necessarily have the desired outcome: long-term sustainability of small cane growers. Rather, they may be curative rather than preventative, with no guarantee of a 'cure', exposing the high level of risk to failure.

32 UNCTAD (2000).

5.3.4 Options to address the key aspect

Different options are available to address the impacts affecting the vulnerability, and hence sustainability, of the small- and medium-cane growers, with some issues being investigated, if not addressed, by the sugar industry. Based on this study it is recommended that emphasis be given to an evaluation of the management models for small cane growers currently promoted by developers (e.g. SWADE). As stated above, this is regarded as the basic core issue to potential high levels of risk.

An evaluation would comprise a SWOT analysis of current models, and comparing the models with other options (such as co-operatives). *Particular consideration need to be given to outsourcing the management of the FAs, employing an outside private company to manage all the FAs in one development, such as in LUSIP and KDDP, and thus taking direct management responsibility away from the farmers themselves*. Already this happens, to some degree, where the Millers 'manage' outgrowers.

The evaluation process would involve intense public participation at all levels, and particularly with the farmers themselves. It would require a supplementary education process, to ensure that the different options are presented before informed decisions are made.

Once there is agreement on an acceptable and workable management system, activities could then be directed towards strengthening the operation of the small cane growers, such as through infrastructure development (including local road networks), extension service provision, training in irrigation agriculture, assistance with HIV/AIDS-related concerns; and securing land tenure.

Within the current situation, if there is no change to the management model, the main focus would be towards the capacity building and training of farmers, particularly in skills relating to managing farms, individually and as part of a FA. Concern around the lack of management skills was raised continuously, by emerging farmers, farmers already in FAs, and other bodies consulted.

In any event, although it is recognised that training programmes are in place, they seem to be offered by numerous organisations (the MOA, SHIP, the SSA, SWADE and Millers, for example), provided *ad hoc* with little coordination. One body need be designated the task of managing training across-the-board, ensuring that the training offered is appropriate to the requirements of farmers, is of a high level, is standardised across the country, and is being implemented, reaching all those in need.

Co-ordination will be the primary task of such an organisation. Other responsibilities will include: a review of the training/support needs of FAs through a needs assessment; setting up a database of existing and potential training organisations, who will need to register and qualify as trainers; developing criteria to standardise the training programmes offered; disseminating information on what training is being provided, by whom and when; and monitoring and evaluating the content and implementation of the process.

Other issues are regarded as relevant, requiring consideration. In order to address concerns around a 'safety net", an option of high priority is ensuring social safeguards against potential failure of sugar cane farming through allocating portions of land to alternative crops and livestock farming.

Studies have been conducted into the possible diversification of farming into cash crops other than sugar, and consideration around this is ongoing. However, for those farmers with sugar cane as their primary cash crop, on a farm level there is a need to allocate portions of land to grow subsistence crops and to keep livestock. It seems that the allocation of land for food is being considered, and in some cases implemented, by LUSIP and KDDP. Having this

safety net would alleviate fears around food (in) security, and of spiralling into the cycle of poverty if cane farming does not succeed, and needs to be standardised across all project developments involving small cane growers.

An additional option for consideration is to undertake a cost-benefit analysis of the socio-economic impacts of mechanisation on the sugar industry.

Many financial aspects affecting cane growers have been addressed, primarily as part of the SSAs Smallholder Assistance Action Programme and implementation of the NAS. Complementary to this, and filling in a gap that has been identified during this StrEA, could be research into the impact of mechanisation on income and hence cash flow. Mechanisation will have both positive and negative affects; it may reduce labour requirements (thus indirectly related to HIV/AIDS) and labour costs, yet result in higher investment in equipment and energy costs, and cause the loss of jobs and potentially increase levels of poverty. Research into mechanisation would thus link in with broader socio-economic impacts.

Recommendations for intervention are based on the above options, giving priority to investigating alternate management models for small cane growers. The other issues identified can be supportive to this, running parallel to the process, namely strengthening capacity building and training, assurance of a safety net through allocation of parcels of land to alternate (subsistence) crop production, and research into the socio-economic implications of increased mechanisation of the sugar industry.

5.4 Key aspect 3: Loss of biodiversity due to land-take for sugar cane expansion (High Priority)

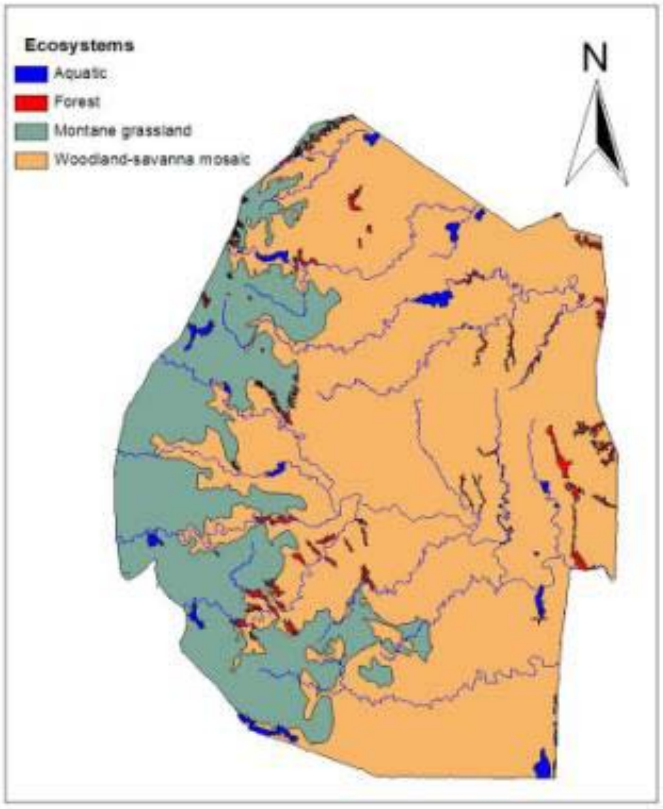
5.4.1 Current state

Various components of Swaziland's biodiversity have been inventoried and researched over the past few decades. Most of this work has been aimed at producing checklists and atlases, which document presence and distribution of species, respectively. Recently work has also been conducted on mapping ecosystems and vegetation types.

5.4.1.1 Ecosystems

During the development of the National Biodiversity Strategy and Action Plan (NBSAP), the importance of taking an ecosystem approach for the successful conservation of biodiversity was recognised and an ecosystem map for Swaziland was drafted. This map shows ecosystems as opposed to geographical regions or vegetation types. The four ecosystems are (see Figure 15): (1) montane grasslands; (2) savanna-woodland mosaic; (3) forests; and (4) aquatic systems.

Figure 16: Map of Swaziland showing the four ecosystems developed and adopted by the NBSAP



Source: National Biodiversity Strategy and Action Plan (NBSAP)

The area covered by each of these ecosystems varies greatly with aquatic and forest ecosystems accounting for just 6% of Swaziland's total area. The savanna ecosystem has the greatest area under protection (5%), while just 2% of each of the other three ecosystems is currently protected.

Plants and animals are not uniformly distributed across the four ecosystems. The distribution of vertebrates in relation to these ecosystems has been studied (Monadjem *et al.* 2003) and can be used as an example. The savanna ecosystem supports the highest number of species, followed by montane grassland, aquatic ecosystem and lastly forest (Table 11). Furthermore, species composition varies greatly between ecosystems. The "afromontane" fauna corresponds with aquatic ecosystems in high-lying montane grasslands, while the "East African lowland" fauna corresponds with aquatic ecosystems in low-lying savannas. Similarly, there appear to be two broad mammalian faunas (Monadjem, 1998); one corresponds with montane grasslands, while the other with low-lying savannas. Though not quantified, a similar pattern seems to be evident in the avifauna. It is interesting to note that the greatest number of endemic and near-endemic vertebrates occur in the montane grassland ecosystem (Table 11). Interestingly, trees show a different pattern to that of vertebrates, with forests having the highest diversity (this is discussed further, below).

Table 11: Species diversity by ecosystem

Taxon	Grassland	Savanna	Forest	Aquatic	Total
Fish	0	0	0	51 (100%)	51
Amphibians	9 (21%)	10 (24%)	1 (2%)	37 (88%)	42
Reptiles	51 (46%)	76 (69%)	12 (11%)	7 (6%)	110
Birds	138 (28%)	290 (58%)	91 (18%)	97 (19%)	500
Mammals	49 (39%)	95 (75%)	13 (10%)	1(1%)	127
Total	247 (30%)	471 (57%)	117 (14%)	192 (23%)	821

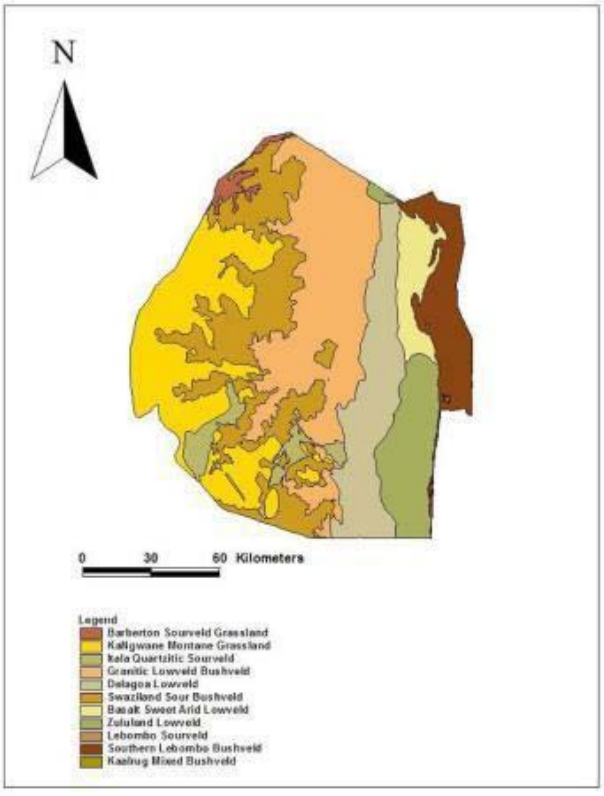
Values in brackets represent the percentage of the total indigenous fauna (from Monadjem et al. 2003b)

5.4.1.2 Vegetation types

The vegetation of Swaziland was originally described by I'Ons (1967) and Acocks (1988). Based on this material, Sweet and Khumalo (1994) provide a detailed description of the vegetation in Swaziland, which they then classified into 22 units within the six physiographic zones mentioned above. A new vegetation map has recently been produced and published in the Swaziland Tree Atlas (Loffler and Loffler, 2005).

These vegetation units are based on climatic, topographic, and soil characteristics as well as plant species composition. The vegetation classification of Sweet and Khumalo is similar to the vegetation types described by Goudie and Price Williams (1983), but is more detailed than the latter. In contrast, the vegetation map of Dobson and Lotter (2004) is based on the categories developed for South Africa, and hence demonstrates a regional perspective lacking in earlier maps.

Figure 17: Map of the recently produced vegetation types of Swaziland

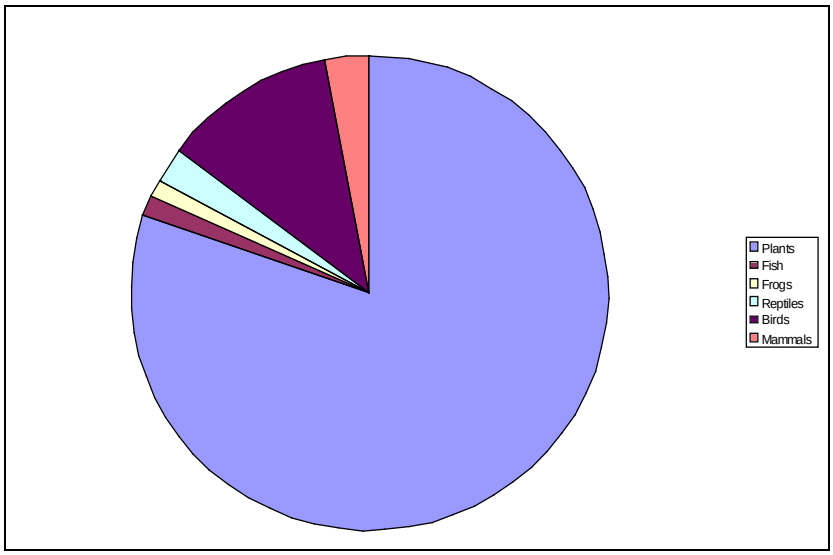


(Source: Dobson and Lotter 2004)

5.4.1.3 Fauna and Flora

By comparison with the southern African region, the plants and animals of Swaziland have been relatively well surveyed. This is particularly true for trees, birds and frogs. However, very limited information is available for certain groups such as the majority of invertebrates. In a comparison of species richness of plants and vertebrates, the former account for more than three-quarters of the species, followed by birds (Figure 18).

Figure 18: Graph showing proportional contribution of plant and vertebrate animal species in Swaziland



5.4.2 Endemism

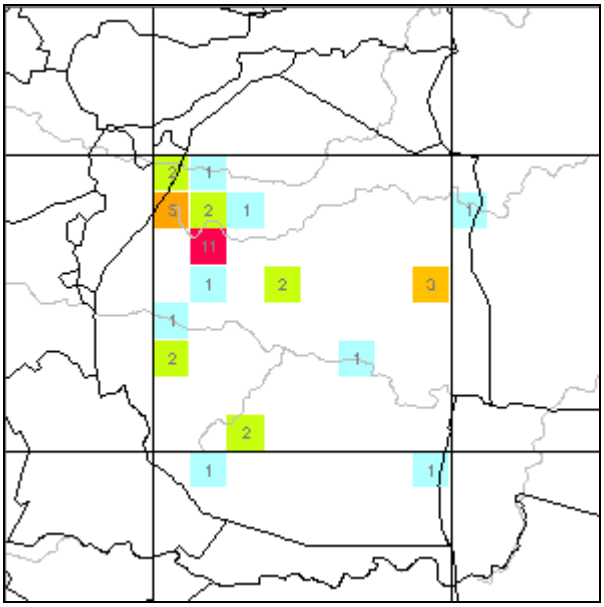
Despite the small size of the country, Swaziland has an impressive list of endemic species. A total of 20 endemic plants are listed for Swaziland (Dlamini and Dlamini, 2002) or suspected to be endemic (Dobson and Lotter, 2002). The highest species richness of endemic plants (accounting for 60% of endemic species) lies within montane grasslands around Mbabane and Malolotja Nature Reserve in the north-western part of the country (Figure 19). The northern parts of the Lubombos support a smaller proportion of endemics, with a small number of species scattered around the country (Monadjem *et al*, 2003a).

The sole endemic vertebrate is a lizard; the Swazi thick-tailed rock gecko (*Afroedura major*) which occurs in rocky outcrops on the ecotone between the montane grassland and savanna ecosystems (Table 12).

No other vertebrates are endemic to Swaziland. However, a number of species are near-endemics, occurring in neighbouring South Africa and Swaziland only. A total of 52 such bird species have been documented from Swaziland, with half of them restricted to montane grasslands (Table 12).

Montane grasslands, therefore, play an important role by providing habitat for many of Swaziland's endemic and near-endemic plants and animals.

Figure 19: Distribution of endemic plant species richness in Swaziland



(Source: Monadjem *et al*, 2003a)

The box with a number indicates the number of endemics

The box colour refers species richness of endemics - blue (low richness), green (moderately low richness), light brown (moderately high) and red (high)

Table 12: Distribution of endemic and near-endemic vertebrates in ecosystems of Swaziland

Taxon	Grassland	Savanna	Forest	Aquatic	Total
Endemic (vertebrates)	1 (100%)	0	0	0	1
Near endemics (birds)	26 (50%)	13 (25%)	12 (23%)	1 (2%)	52

(Source: Clancey 1986; Monadjem et al. 2003a)

Figure 20: Simunye sugar estate bordering the Hlane game park

5.4.3 Expected impacts in absence of the NAS

Biodiversity in Swaziland is under increasing threats to both its distribution as well as its composition. The threats extend beyond just land conversions to cane but include several other activities that are causing its decline or degradation.

Many species in Swaziland have declining populations, some of which have already gone extinct such as the African wild dog (*Lycaon pictus*). A necessary first step to conservation is an assessment of species status to identify and, where possible, quantify rates of decline. Swaziland has produced two recent red data lists; one for plants (Dlamini and Dlamini, 2002) and one for vertebrates (Monadjem *et al*, 2003a). The former list has been updated for trees (Loffler and Loffler, 2005).

A total of 132 species of vertebrates are listed in this book, consisting of 11 species of fish, 4 species of amphibians, 14 species of reptiles, 55 species of birds and 48 species of mammals (Table 13). These threatened species represent between 9-20% of the total numbers of fishes, amphibians, reptiles and birds occurring in Swaziland, but a significant 38% of the mammalian fauna. When only the high risk categories are considered (i.e. regionally extinct, critically endangered, endangered and vulnerable), the threatened birds and mammals represent between 7-9% of their total species richness, while the fishes, amphibians and reptiles represent between 2-4% of their diversities. Therefore, in both absolute and relative terms, birds and mammals are disproportionately threatened in Swaziland.

Table 13: Summary of the number of vertebrates in each threat category

	Number of species				
Threat category	**Fishes**	**Amphibians**	**Reptiles**	**Birds**	**Mammals**
Regionally Extinct	0	1 (2%)	0	7 (1%)	3 (1%)
Critically endangered	3	0	0	1	0
Endangered	1	0	0	12	3
Vulnerable	2	0	2	14	6
Sub-total (threatened)	6 (10%)	0	2 (2%)	27 (5%)	9 (7%)
Sub-total (others)	5	3	12	21	36
Total	**11 (18%)**	**4 (9%)**	**14 (13%)**	**55 (11%)**	**48 (37%)**

Values in brackets represent the percentage of the total indigenous fauna occurring in Swaziland

Of the 34 high risk species of birds, 13 (38%) species are birds of prey and a further 9 (26%) species are water birds (or birds associated with wetlands). These two groups of birds, therefore, account for almost two-thirds of threatened birds (Monadjem and Rasmussen, 2008), even though they only represent less than one-third of the species diversity. Of the 12 high risk species of mammals, 9 (75%) are either ungulates or large carnivores (>10 kg). These four groups (birds of prey, water birds, ungulates and large carnivores) account for 61% of all high risk vertebrates.

A total of 305 species of plants have been included in the red data list for the country, representing 9% of the total plant species richness. However, 62 species (2%) are threatened (Critically Endangered, Endangered or Vulnerable), while 155 species are data deficient.

In the absence of the NAS, biodiversity decline will continue due to several other threats affecting biodiversity around the country.

Land degradation, fragmentation of habitats, alien plant invasions and rapid degradation of the biological resources are the key challenges to be addressed by the country. The various policy and legislative initiatives launched by government since Rio have so far remained

mostly on paper, are not cross-sectoral or integrated and most importantly are not matched by adequate funding and expertise to implement the measures recommended by stakeholders. Swaziland's classification as a lower-middle income country has contributed to the difficulty in accessing donor funding for conservation and environmental management.

Regional threats include factors such as atmospheric and water pollution, reductions of flow in rivers that have their sources in South Africa, cross-border smuggling of organisms and the increasing spread of alien invasive plant species from neighbouring countries. Local threats to Swaziland's biodiversity can be grouped into the following categories: 1) those that destroy or alter the habitat, 2) over-exploitation, 3) the impact of exotic species, 4) weak law enforcement, 5) inadequate awareness of value of resources, 6) population growth, 7) lack of equity in ownership and management of biodiversity and 8) climate change.

Relative importance of different types of anthropogenic threats on terrestrial, freshwater, estuarine and marine ecosystems in Swaziland are presented in the following table:

Table 14: Anthropogenic threats on terrestrial, freshwater, estuarine and marine ecosystems in Swaziland

Threats	Terrestrial	Freshwater
Habitat loss and degradation	●●●	●●
Flow modification	●	●●●
Invasive alien species, hybridisation and Genetically Modified Organisms (GMOs)	●●●	●●●
Over-harvesting	●●●	●●
Pollution	●	●●●
Climate change	●●●	●●●
Law enforcement	●●	●●
Lack of equity in ownership and management of biodiversity	●●●	●●

●●● – severe threat; ●● – significant threat; ● – threat

The loss and degradation of Swaziland's biodiversity has serious implications for its society and economy. Natural ecosystems provide many essential services such as the provision of clean water and air, prevention of soil erosion, pollination of crops, provision of medicinal plants, nutrient cycling, provision of food and shelter and the meeting of spiritual, cultural, aesthetic and recreational needs. Large portions of the country's economy are heavily dependent on biodiversity including livestock ranching, horticulture and agriculture, commercial and subsistence use of medicinal plants, and ecotourism. The majority of Swazis are highly dependent on natural resources for their livelihoods, a situation which has been greatly aggravated by the HIV/AIDS crisis, the declining economy and increased unemployment.

In addition, intact ecosystems (i.e. ecosystems which are in a natural or near natural state) are likely to play an important role in providing cost-effective resilience to the impacts of climate change, including buffering human settlements and activities from the impacts of extreme climate events.

5.4.4 Expected impacts with implementation of the NAS

The implementation of the NAS is likely to have significant effects on Swaziland's biodiversity through the clearing of land to make way for additional cane growing areas and other infrastructure to support irrigated cane production and processing.

Many of the lands where sugar cane cultivation is taking place were previously natural bush; in a specific case land was exchanged from the Hlane National Park to accommodate an RSSC expansion need.

Natural vegetation keeps being removed for sugar cane expansion associated with the LUSIP and KDDP schemes thus disrupting natural ecosystem functions and services.

Pressure is increasing on areas of high biological diversity for conversion to agriculture and irrigated sugar in particular. Long term environmental benefits and services are being forfeited for short term economic benefits. Increased availability of water for expansion purposes will increase the threat to areas of high biological diversity.

Although EIAs are carried out for specific irrigated cane developments, no systematic assessment of cumulative impacts has taken place. The environmental implications of this are aggravated by the absence of effective protection of biodiversity (e.g. network of protected areas with representation of native, threatened and endangered species).

The NAS provides no specific support for biodiversity management or conservation nor does the NAS measures explicitly describe requirements for investigating biodiversity impacts and mitigating for any losses.

Stakeholders identified several areas of concern:

Land Conversions

All cane farms were once natural habitats that have been converted to cane. NAS support for an additional 15,000 ha of new development will significantly increase the loss of or impact on biodiversity. The conversion of natural bush, livestock grazing areas, arable land and riverine areas to cane production for LUSIP and KDDP have been subjected to various environmental impact assessments (SWADE, 2005; SWADE, 2006; Vakakis International, 2000; SWADE, 2003) and these have been reviewed and approved by the Swaziland Environment Authority.

Concerns have arisen that many of these assessments did not specifically look at the biodiversity impacts in sufficient detail, particularly the cumulative impacts of the biodiversity losses across all the various projects. It is not that uncommon for the assessment reports to suggest that the removal of certain species associated with the project site can be justified as the same species can be found elsewhere in the country. As true as this maybe, the concern is that each land conversion is cumulatively decreasing the distribution and composition of the given species until, logically, there may only be one place left where it occurs naturally – probably within a protected area.

Current practices to systematically assess and protect biodiversity is said to be inadequate in identifying important components of biodiversity and there are concerns that during land preparation such measures are not implemented in their entirety or at all, resulting in the unnecessary loss of biodiversity.

In addition to land conversion to cane, conversions are also taking place for settlements, afforestation and other forms of farming and these are heavily affecting biodiversity and are often outside the ambit of the EIA.

Little attention is given to sustainable land use planning at a national scale and certainly at project level often resulting in inappropriate land uses and loss of biodiversity.

Compliance

Concerns have also arisen around the country's capacity and commitment to independently monitor the implementation of the various mitigation plans. Some stakeholders have noted that once the EIA has been approved, land clearing and other impacts are carried out in a manner that bears little resemblance to the provisions of the mitigation plan. This is

particularly true where mitigation plans are implemented by resource-poor farmer associations who have limited access to costly professional monitors and advice.

Stakeholders noted that the SEA routinely fails to monitor project mitigation plans for compliance allowing measures designed to protect or enhance the environmental performance of the project or FA to be overlooked with direct impacts on biodiversity. The SEA often assume the proponent of the project, i.e. a FA or institution will monitor the implementation of the plan but in many cases the FA or institution have little capacity to do this, and with no follow-up or oversight the mitigation plans are rarely implemented as intended.

Some stakeholders have identified that the degree of protection of affected natural vegetation and fauna within the country is inadequate. The Flora Protection Act does provide a schedule of protected species but this list is routinely ignored and species designated as threatened, protected or vulnerable are often removed without adhering to the provisions of the Act.

Figure 21: Clearance of native vegetation for sugar cane farming

Pollution

Pollution of water bodies from industrial effluents and from agricultural run-off is adversely affecting the biodiversity of the aquatic environment. Recent legislation in the form of the Water Pollution Control Regulations of 2010 should, if implemented, be a useful instrument to manage pollution of water bodies. The risk will be little or ineffective enforcement.

Livestock

Increases in land under cane as a result of NAS support usually results in livestock and their grazing areas being displaced. Project level EIAs sometimes consider the impact of grazing land losses and propose mitigation that usually involves movement of livestock to neighbouring areas. This transfer of livestock to unassessed areas results in increased land degradation and biodiversity losses. The LUSIP and KDDP projects are recent examples of significant livestock displacement.

Resource utilisation

Biodiversity is an important source of natural resources for communities (fuel, timber, medicinal, cultural). The lack of regulation governing access and utilisation leaves biodiversity as a free and exploitable asset. In-migration of people to new or developing cane areas adds additional pressure on natural resources.

Other issues

Indirect impacts of cane production, particularly on neighbouring protected areas is reported by conservation managers to be affecting their functions - noise from trucks and trains scares wildlife away from areas adjacent to roads and rail links, spray drift from aerial application of agrochemicals often affects biodiversity along reserve or protected area boundaries and agrochemical runoff into streams that pass through protected areas degrades their quality and may affect wildlife.

5.4.5 Options to address the key aspect

Although the NAS has little on environmental impacts and issues, the potential for impacts arising from its implementation is significant.

5.4.5.1 Land conversion

Current legislation is not adequate for comprehensive biodiversity protection and management – the Biodiversity Conservation and Management Bill and Policy remains as a draft but there is an opportunity to review it to ensure NAS related impacts are adequately represented.

Biodiversity corridors or areas of high biological diversity need to be identified and protected within project areas. The EIAs should identify corridors through and across large irrigation schemes. The SEA and SNTC must be strengthened to ensure compliance by the FAs or institutions responsible for the project implementation. Corridors provide a unique and useful intervention to protect biodiversity, ecosystems and habitats that often have beneficial services to the sugar sector.

5.4.5.2 Compliance

Lack of compliance to the mitigation plans developed for FAs or large schemes was noted as a major threat to biodiversity. A shift is needed in compliance monitoring from SEA to joint monitoring with the millers with a detailed and agreed monitoring plan. A committee of experts would help identify the gaps in monitoring plans and develop strategies to overcome the poor compliance.

During the review of EIAs specific attention is needed on biodiversity impacts (biodiversity specific impact assessment). The Convention on Biological Diversity has published voluntary guidelines for biodiversity impact assessments and the SEA should review these and effect relevant sections within its broader mandate for EIA approvals.

Lack of compliance is reported to be attributed to a lack of capacity or understanding on the part of the FA or other responsible institution. EIA mitigation plans should be better developed to suit the capacity and resources of the FAs with clear monitoring plans and defined institutional commitments.

Greater emphasis is needed to encourage the SEA to undertake their legal obligation to monitor the implementation of mitigation plans. A great deal of environmental damage has resulted from poor or inadequate monitoring of project EIAs.

Some stakeholders called for the production of national biodiversity maps at an appropriate scale to ensure areas of high conservation value are identifiable and thus during project preparation phases, such areas can be immediately removed or deliberately assessed.

For large scale projects undertake an assessment of biodiversity to identify linkages between biodiversity components and exclude areas of high conservation value.

Enforcement of legislation is key to ensuring viable and production habitats. The SEA, SNTC and other stakeholders (MOA, MNRE) need to develop mechanisms to enforce their legislation.

5.4.5.3 Pollution

Pollution of water has been noted by many stakeholders as an area of great concern. Pollution represents resource waste and should be targeted by polluters to identify where and how such waste can be eliminated. Enforcement of the 2010 water pollution control regulations would clearly assist reducing the levels of pollution. Within FAs, greater effort is needed to capacitate FAs to ensure adequate resources are available for pollution control. Unfortunately under existing financial loan arrangements resources are not made available for environmental compliance. The NAS partners need to discuss this with the lending institutions to ensure resources are or can be made available.

Capacitate FAs with necessary skills to reduce agricultural runoff.

5.4.5.4 Livestock

EIAs must assess impact on livestock when grazing areas are converted to cane. Livestock impact assessments should be mandatory for cane projects where grazing areas are to be converted to cane.

5.4.5.5 Resource utilisation

Assessment and mapping of biodiversity in project affected areas may help quantify and identify commonly utilized resources and place controls over its utilisation or quantify sustainable utilisation rates

5.4.5.6 Other issues

FAs and supporting partners (millers) are asked to review their existing and potential impact on neighbouring protected areas and develop strategies in collaboration with the protected area managers, to minimise the identified impacts.

5.5 Key aspect 4: Risk of HIV/AIDS associated with the sugar cane industry, particularly in relation to smallholder irrigation schemes (High Priority)

5.5.1 Current state

According to the Second National Multisectoral HIV and AIDS Strategic Plan 2006-2008[33], the first case of HIV to be identified in Swaziland was in 1986. Since then the virus has spread extensively in the country, and developed into an epidemic, growing to a point of being “generalised, mature and very deeply entrenched”. ‘Generalised’ as it is not restricted to isolated localities and/or particular social groups; people who carry the virus come from all segments of society, irrespective of age, gender, socio-economic standing, education, marital status or religious affiliation, thus the risk of being infected is a reality for all sexually active people. ‘Mature’ in that its impact is overt, with illness, death and its consequences

33 Government of the Kingdom of Swaziland (2006).

common to the extent that no individual, community or organisation has not been affected in some way. 'Entrenched' given the high percentage of those with the virus.

The HIV prevalence rate in Swaziland is said to be amongst the highest in the world[34]:

- An estimated 18.8% of the population (aged two and older) was infected with the virus in 2006/07[35]. In 2007 the number estimated to be living with HIV was 185,005.
- The prevalence level was 5.8% among youth in the 15-19 age group, rising to 26.3% for those 20-24 years of age and 39.2% for those aged 25-29. The highest level of infection (44.9%) was in the 30-34 age group, followed by 40.7% for those aged 35-39. The HIV rate declined to 32.3% for the 40-44 age group and to 24.2% for people between 45-49 years of age, rising slightly to 25.9% among those aged 50-54.
- The age patterns of HIV infection differ for women and men. Overall in 2006/07 more women (22.1%) were HIV positive than men (14.9%)[36]. Among the population under 35 years of age, HIV rates for women were higher than for men, peaking to 48.9% in the 25-29 age cohort. For men the infection rate was at its highest level in the 35-39 age group (44.9%).
- In 2006/07 the estimated rate of infection amongst adults (aged 15-49) was 26.1%: 31.5% in urban areas, and 23.7% in rural areas. By region the adult HIV rate varied from 23.1% in Shiselweni, 25.0% in Manzini, 26.2% in Lubombo, and 28.8% in Hhohho. The rate of HIV prevalence was higher among adults who never attended school than those who attended school. Among educated women the rate generally declined with the level of schooling, while among men the pattern was more variable.

The main causes of the epidemic are biological, behavioural and socio-economic. Biological includes a proneness to women contracting the disease due to physical makeup; socio-economic factors, that poverty and income inequality levels expose people to providing sex for financial and material gain. Behavioural aspects include the subordinate social status of women to men, placing them in a vulnerable position to the risk of HIV infection; a lack of (correct) knowledge about virus transmission and methods of protection; and negative attitudes to prevention through abstinence, faithfulness and condom use. There is the view that the country "has a number of potentially high-risk traditions and current practices that make the population vulnerable to HIV infection (which) include multiple sexual partners, changing sexual partners, sex at social gatherings … intergenerational sex, the early onset of sexual activity, (and) gender inequality" (UNDP, 2007).

The causes of the high levels of HIV/AIDS in the sugar sector can be attributable to a range of factors, amongst which has been the in-migration of males to seek work, not only from Swaziland but from neighbouring countries such as Mozambique, an increase in the number of casual seasonal workers, the raised social status and disposable income of those with work, and single-sex accommodation on the sugar estates, all leading to an increase in the number of commercial sex workers in the area. The dependence of women on men in controlling the terms under which they have sex, including whether a condom is used, and the vulnerability of neighbouring communities to the offer of money for sexual favours, compound the issue. In addition there are no structural HIV/AIDS prevention/education programmes in place for some smallholder sugar cane schemes.

34 Sources: Central Statistical Office (2008) and www.unaids.org

35 The total population of the country was 1,018,449 according to the 2007 Population and Housing Census, conducted by the Central Statistical Office (CSO).

36 According to the 2007 Census, 537,021 inhabitants of the country were women, and 418,428 were men.

In general, however, the HIV prevalence level is said to be stabilising. According to HIV sero-surveillance surveys of women attending antenatal clinics, HIV prevalence rose from 3.9% in 1992 to 42.6% in 2004, dropped slightly to 39.2% in 2006, rising slightly in 2008 to 42.0% (Ministry of Health, 2008a). A number of factors have contributed to current trends, such as an improvement in the quality and extent of support provided, with more households having access to and receiving information, training and medical supplies (Kingdom of Swaziland and European Commission, 2005a). On a societal level the stigmatising attitude towards the disease has diminished, creating the space for greater openness towards being tested and treated.

National policy development has played a significant role, not only in recognition of the disease, but particularly in its management:

- Initially the government responded to the disease through the health sector, and the Swaziland National AIDS Programme (SNAP) was established in the MoH in 1989. Guidance for HIV/AIDS was presented in the form of short-term and medium-term plans and a health sector policy document in 1998. These focused on blood safety, public awareness, safer sexual behaviour, the prevention of Sexually Transmitted Infections (STIs), Voluntary Counselling and Testing (VCT), community Home-Based Care (HBC), the management of opportunistic infections such as Tuberculosis (TB), the promotion of support groups to People Living With HIV and AIDS (PLWHA), and the mobilisation of young people in their understanding of the disease.
- The National Emergency Response Council on HIV and AIDS (NERCHA) was established by Government in 2001 as a Committee under the Prime Minister's Office, and became a Council by Act of Parliament No. 8 2003[37]. NERCHA's mandate is to co-ordinate and facilitate a national response to HIV/AIDS, to oversee the implementation of the National Multisectoral Strategic Plan (NSP) for HIV and AIDS, and to develop the National Multisectoral Strategic Framework (NMSF) for HIV and AIDS 2009-2014. The NMSF describes a 5-year framework for HIV/AIDS, informed by the National Multisectoral HIV and AIDS Policy (2006) and lessons learnt through the Second National Multisectoral HIV and AIDS Strategic Plan (NSP II 2006-08): to scale up/mainstream response strategies. In addition, NERCHA developed a comprehensive National Monitoring and Evaluation System, which outlines the goals, objectives, indicators, data sources and reporting arrangements required for monitoring HIV prevalence, and the country's programmatic response.

The policies have been developed in the context of a number of key international and national documents.

On an international level, of significance are the Millennium Development Goals (MDGs), commonly accepted as a framework for measuring development progress, and for guiding funders in determining their development assistance[38]. The goals are directed at reducing poverty through specific targets based on indicators; Goal 6 is to Combat HIV/AIDS, malaria and other diseases.

On a national level, apart from the plans and strategies mentioned above, government publications include the National Development Strategy (NDS) (2002), the National Food Security Policy for Swaziland (2005), the Poverty Reduction Strategy and Action Plan (PRSAP) (2005 revised draft), the Strategy Brief for National Food Security and Agriculture Development (2005), and the Swaziland Annual Vulnerability Assessment and Analysis Report (2009).

37 Pamphlet: What is NERCHA: A Nation at War with HIV/AIDS.

38 www.undp.org

National labour laws on HIV/AIDS in the workplace have also been passed, and include (see Annex 4 for a more detailed description): The Constitution Act No.1/2005; Industrial Relations Act 2000; Code of Good Practice: HIV/AIDS in Employment; The Employment Act 1980; The Employment Bill 2007; Occupational Health and Safety Act 2001; and the Workmen's Compensation Act 1983.

Various bodies have been involved in the implementation of HIV/AIDS policy, as described below.

5.5.1.1 Government Bodies

The MoH is directly responsible for the welfare status of the people of Swaziland "by providing preventive, promotive, curative and rehabilitative services that are relevant, accessible, affordable, equitable and socially acceptable"[39]. Approximately 80% of the multisectoral response to HIV/AIDS falls within the health sector, the MoH. The Directorate of Health Services is responsible for public health and curative services, and National Public Health programmes include HIV/AIDS through SNAP. SNAP works in ten areas, each with its own guidelines and policies: Management; Psychology; Prevention; Condom Education/Distribution; Quality Assurance; Circumcision; STIs; HBC; VCT; and Antiretroviral (ARV) Therapy.

Although completed, of interest is an agreement between the European Commission (EC) and the Government of Swaziland on a 3-year HIV/AIDS Prevention and Care (HAPAC) Programme in 2002-2005. This was made in response to the increasing HIV/AIDS crisis in Swaziland, "to reduce the spread of HIV and alleviate the impact of AIDS". Implemented by a Programme Management Unit (PMU) based at the MoH, HAPAC aimed to address three major problems identified by the government as priorities for action (Kingdom of Swaziland and European Commission, 2005a, 2005b):

(1) Limited access to HIV VCT services. The expected outcome of strengthening VCT services was for an increased number of people to have easy access to quality VCT services, to be aware of their existence, and to use the services. This would lead to behaviour change, thereby reducing HIV transmission, and enhancing access to care and support services for people living with HIV/AIDS. Activities included: the establishment and operation of VCT units in Hospitals and Health Centres; the creation of a network of VCT facilities, and a nation-wide awareness campaign to sensitise high-risk populations for the use of the network; and capacity building of VCT programme managers.

(2) Lack of resources for HBC for those with AIDS. The expected outcomes of strengthening HBC was for an increased number of people living with AIDS to receive care and support at their homes by family, community and professional caregivers, and reducing the stigma and discrimination surrounding people with AIDS, leading to a better quality of life of the AIDS patients and their relatives. Activities included: the creation and operation of a comprehensive HBC programme; the creation of a central HBC unit at a Hospital, with outreach capacity; the identification and strengthening of HBC activities by NGOs; and a baseline community survey measuring the extent of HBC on a regional basis.

(3) High rates of STIs, increasing the risk for HIV infection. The expected outcome of strengthening STI care was that an increased number of people with STIs would be promptly and correctly diagnosed, treated and counselled. This was expected to lead to a reduction of HIV transmission, STI transmission and STI complications.

39 www.gov.sz

The HAPAC Programme applied two implementation approaches to achieve its objectives: (1) contracting out services to NGOs; and (2) direct funding of MoH activities.

In order to manage the HIV epidemic in the country, the government formed NERCHA, with the mandate to coordinate a multisectoral response. NERCHA implements this through co-ordination of eight sub-thematic areas: institutional arrangements, community mobilisation, planning and programme development, advocacy and communication, the mainstreaming of cross-cutting issues (human rights, gender, poverty, socio-cultural practices and disability), monitoring and evaluation, HIV/AIDS research, and resource mobilisation and management. The core principles that guide NERCHA in managing its national response are: national and equitable coverage of services, using local solutions and existing structures, community-driven interventions, sustainability, and the mainstreaming of HIV/AIDS.

5.5.1.2 The Private Sector

The Royal Swaziland Sugar Corporation (RSSC)

The RSSC has two irrigated sugar estates, Mhlume and Simunye, whose combined land under cane cultivation is approximately 20,000 hectares, from which it produces sugar (two-thirds of the country's total production), ethanol and related products. The Group operates two sugar mills, a refinery and a distillery. The figures for March 2010 indicated that the company employed 2,592 permanent/fixed term and seasonal employees: 1,764 permanent/fixed term staff (1,443 in Production and 321 in Support Services), and 828 seasonal employees, a figure that varies monthly. In addition there were 78 apprentices and trainees. Aside from the Group's direct employees, a further 20,000 people live on the estates.

Risk management, health and safety are important aspects of the management of the company, with ongoing measures being taken to identify, assess, mitigate, manage and monitor risk. A Safety, Health and Environmental Policy aims to provide working conditions which safeguard all those affected by the operations of RSSC, as well as ensuring the maintenance of a clean and healthy environment. In addition, RSSC has recognised the negative impact of HIV/AIDS on employees, their dependants and the company – that it is a strategic business issue. In the Group's 2009 Annual Report, the Chairman recognises that "*HIV/AIDS continues to be a real challenge*" (RSSC, 2009).

RSSC is certified with AMS 16001/2003 (AIDS Management System standard)[40]. It has also developed a one-page HIV/AIDS Management Policy Statement (March 2009)[41], which endorses the company's commitment to reduce exposure of personnel to the risk of HIV/AIDS, its incidence and prevalence. It seeks to "provide and seek resources to develop and implement effective programme initiatives on HIV/AIDS", through:

- providing a framework, guidelines and parameters for the effective management of HIV/AIDS within the company;
- encouraging employees, their families, and community members to know their HIV status;

40 AMS 16001, the first risk management system standard to rate and manage HIV/AIDS programmes, provides companies with a standard that will guide them towards cost effective anti-HIV/AIDS treatment programmes. "The standard ensures survival in a worsening HIV/AIDS environment where risk management has to assume new multi-dimensional levels of corporate social responsibility. An audited AMS 16001 standard rating is internationally recognised as the only reliable measurement that indicates a company's ability to survive in the long term. Foreign investors need to know whether their capital will be safe 10 to 20 years from now. Without the AMS 16001 system standard there is no way of telling whether the company will actually exist at that point." (www.timbersa.co.za)

41 www.rssc.co.sz

- creating a supportive environment for those living with HIV/AIDS so as to mitigate the impact of HIV/AIDS on the individual, the company and the community; and
- ensuring the availability of accessible HIV/AIDS prevention, medical drugs, care and support services.

The Statement affirms that the same ethical principles that guide other health conditions in the employment context of the company will apply to HIV/AIDS, "including confidentiality, fair employment practices, non-discrimination, shared responsibility and sustainability". There is no testing of HIV as a condition of employment, nor discrimination based on an individual's HIV status. However, RSSC conducts an HIV prevalence survey every five years to determine the magnitude of HIV in the company, and an actuarial analysis with cost projections for the same period. In-depth and quality assessments are also carried out as/when required, including an HIV/AIDS risk assessment.

The company's approach is to manage HIV/AIDS, working in partnership with employee organisations, the government (particularly the MoH and NERCHA), the UN and other international agencies. This is facilitated through the HIV/AIDS Tripartite Committee, with representation by Management, the Union and the Staff Association. An HIV/AIDS Programme Co-ordinator coordinates all HIV/AIDS programmes and related issues.

As well as an Employee Assistance Programme (EAP), which provides care and support for those affected by HIV/AIDS, the RSSC provides health care at two site-based clinics, which are centrally managed by the Medical Services Department. The emphasis is on primary health care and the prevention of diseases, including HIV/AIDS. In 2003 two VCT centres were established jointly with NERCHA, one at each estate. Since 2004, ARV is provided to employees free of charge, made possible through NERCHA from the Global Fund. However, the company is reducing its medical service, which may negatively affect its response to HIV/AIDS.

RSSC has an Outgrower Development Department in the Agriculture Division. Over 2,500 families are currently involved in sugar cane production as small-scale farmers who deliver to the RSSC's two mills. From a land area measuring 11,356 ha, they produce 1.2 million tonnes of sugar cane, supplying 52% of Mhlume mill's total cane and 25% of Simunye mill's total cane. By March 2009 more than 4,028 ha of cane had been developed by small-holder farmers in the Komati Basin, under the auspices of the Swaziland Water and Agricultural Development Enterprise (SWADE). Although RSSC has an HIV/AIDS Outreach Programme, the farmers do not benefit directly from the RSSC's HIV/AIDS health services, and are thus reliant on governmental or non-governmental support.

Ubombo Sugar

Ubombo Sugar has one sugar mill located at Big Bend, which produces sugar from its own estate and receives cane from cane growers in the vicinity, including from LUSIP. The LUSIP project involves the establishment of up to 11,500 ha of irrigated agricultural land over a period of six to seven years, a large proportion of which will be developed as sugar cane for delivery to the Ubombo factory, where milling capacity is to be increased to accommodate the expansion. Under the current development plans it is envisaged that an additional 1,900 ha of cane will be available for milling at Ubombo by the 2011/12 season, increasing up to 9,000 ha in the long term (Illovo Sugar Limited, 2009).

Ubombo's employment conditions include access to primary health care for employees and their dependents, through the health centre and/or the provision of medical insurance. The company owns and manages a 40-bed hospital to serve employees and the Big Bend community.

The company implements an HIV/AIDS policy. HIV/AIDS is being managed, largely on a preventative basis, to negate its impact on the business and employees. Strategies towards controlling the spread of the disease include preventative awareness programmes, and an in-house Wellness Programme for those affected. Activities involve ongoing education campaigns, effective treatment and prevention of STIs, use of peer counsellors, use of prophylactic antibiotics, effective screening for TB, and the promotion of a healthy lifestyle. In particular, whilst acknowledging confidentiality in the testing and recording of the disease, VCT has been encouraged and is regarded as key to controlling the disease. To this end, the company has set a target to test at least half of its employees annually.

The company also assists in implementing the government-funded ART programmes at its mill-based medical facilities. For TB it supports government with the diagnosis, treatment and follow-up of cases.

As with the RSSC, however, the company has trimmed its health service, and does not extend its operation to outgrowers.

5.5.1.3 Non-Governmental Organisations (NGOs)

In Swaziland, many NGOs, national and international, are involved in different aspects of HIV/AIDS: awareness and education, training/capacity building, VCT and psychological support, peer education, treatment, medical supplies, OVC care, palliative care, social welfare, food distribution, development projects, and disaster management. Most are affiliated to the Coordinating Assembly of Non Government Organisations (CANGO), which coordinates the activities of a consortium of NGOs under, for example, an HIV and AIDS NGOs involved in HIV/AIDS include (CANGO, nd): Africa Cooperative Action Trust (ACAT); Alliance of Mayors Initiative for Community Action on AIDS at the Local Level (AMICAALL); Business Community and HIV/AIDS (BCHA); CARE Nakekela; CARITAS Swaziland; Council of Swaziland Churches; Family Life Association of Swaziland (FLAS); Forum for African Women Educationalists Swaziland Chapter (FAWESWA); Lutheran Development Services (LDS); Population Services International (PSI); Save the Children; Schools Health and Population Education (SHAPE); Swaziland Hospice at Home; Swaziland AIDS Support Organisation (SASO); The AIDS Information and Support Centre (TASC); the Salvation Army Primary Health Care and Community Centre; SOS Children's Village; the Swaziland National Network of People Living with HIV and AIDS (SWANNEPHA); Swaziland Boy Scouts Association; Swaziland Conference of Churches; Swaziland National Network for People Living with HIV/AIDS; Swaziland Positive Living for Life (SWAPOL); Swaziland Red Cross Society; Traditional Healers Organisation (THO); World University Services, Swaziland; and World Vision[42].

5.5.1.4 International Organisations

As well as international NGOs, international organisations such as the World Food Programme (WFP), the World Health Organisation (WHO), UNDP and UNAIDS collaborate with the Government to provide an HIV/AIDS service, supporting initiatives on a local and national level[43].

The Government of Swaziland has limited funding allocations for HIV/AIDS, and most of the funding for HIV-related programmes comes through donors[44]. Of particular relevance is the

42 See: World Vision (2007) and www.worldvision.org

43 See, for example, MoHSW (2003); MoHSW (2007); MoHSW (2009a); and MoHSW (2009b).

44 Since donor funding is limited and variable, the country is restricted in the programmes it can implement, according to Whalley (Whalley, nd).

Global Fund, funds from donors spent on HIV/AIDS, TB and Malaria programmes. Activities are coordinated by a Country Co-ordinating Mechanism (CCM), whose Board comprises representation from 37 organisations: UN/multilateral bodies, the MoH and other ministries, NERCHA, NGOs and community-based organisations (CBOs), the private sector/missions, PLWHA, religious bodies, traditional healers, youth associations, woman associations, and academic/education individuals (MoH, 2008).

Global Fund support concentrates mainly on reducing the incidence of HIV/AIDS, and mitigating the impact on infected and affected individuals, families and communities[45]. The Fund's objectives and activities for HIV/AIDS programmes include:

- To promote safer positive sexual behaviour and delay sexual 'debut', through: formulating an Information, Education and Communication strategy, and training trainers on it; establishing a national HIV/AIDS training centre; strengthening youth centres/clubs, and training peer educators/counsellors for them; and distributing male/female condoms.
- To prevent vertical transmission of HIV from mother to child, through: training health workers in the prevention of mother-to-child transmission (PMTCT); procuring PMTCT equipment, material and supplies; and sensitising the public on PMTCT.
- To develop and strengthen VCT centres, through: maintaining the functioning of the centres; strengthening their capacity to provide quality VCT services; upgrading mobile VCT services in Public Health Unit outreach; and making people aware of VCT.
- To strengthen HBC through: conducting refresher courses for key stakeholders; procuring/distributing HBC non-prescriptive drugs/materials; and monitoring and evaluation.
- To strengthen Clinical Management of HIV/AIDS patients, through: procuring antiretrovirals and drugs for opportunistic infections; procuring/supplying laboratory equipment for HIV/AIDS diseases; equipping clinical management services for quality control activities; and procuring transport for drug distribution.

In order to achieve the above, the major functions of the Fund are to:

- prepare/review new submissions of projects from implementers;
- approve proposals/budgets of prospective recipients; and
- monitor and evaluate the implementation of activities.

Since being established in 2002, the fund has been instrumental in initiating new programmes, scaling up services, strengthening capacity, and assisting in creating a conducive environment for optimum service provision. However, in its assessment of attaining its objectives, the Fund concludes that the institutional capacity of the health sector is not adequate to facilitate and effectively implement Fund-supported activities due to a shortage of human resources, poor co-ordination and integration of activities in the health sector, and poor monitoring systems. In response, recommendations include:

- planning: to improve planning processes within the health sector, involving all stakeholders;
- coordination: to reinforce MoH capacities to implement and monitor the health sector response to HIV/AIDS; partners such as NERCHA to provide technical support to

45 NERCHA is the principle recipient of the funds.

improving co-ordination; to have a clear definition of roles and responsibilities of key implementation players;

- monitoring and evaluation: to strengthen monitoring and evaluation systems; the MoH to clearly define indicators for performance tracking;
- capacity building: to provide training and guidelines to strengthen capacity for the planning and implementation of the health sector response;
- communication: to improve communication between NERCHA and the MoH, and other stakeholders; and
- financial: to establish mechanisms to ensure a resource mobilisation strategy.

5.5.2 Expected impacts in absence of the NAS

HIV/AIDS has played a major role in Swaziland's human development status. The UN's Human Development Index (HDI), which provides a broad perspective on human progress and well-being, is a composite measure of three dimensions of human development: living a long and healthy life, being educated, and having a reasonable standard of living[46]. Swaziland's HDI increased from 0.530 to 0.623 between 1975 and 1990, but declined to 0.517 in 2006, largely attributed to deteriorating social and economic indicators, mostly as a result of HIV/AIDS. At the same time the country has one of the highest scores on the Human Poverty Index (HPI-1) (53.9%), which focuses on the proportion of people below certain threshold levels in each of the dimensions of the HDI. For deprivation in health, the proportion of people who are not expected to survive to age 40 is measured.

Social consequences of the spread of HIV/AIDS include the following:

- With increasing rates of morbidity and mortality, particularly within the reproductive age group, the demographic profile of the country is becoming skewed towards older age groups and the very young – representing the non-productive, dependent members of society. Largely due to HIV/AIDS, life expectancy has dropped from 56 years in 1986 to 32.5 years in 2003 (Government of the Kingdom of Swaziland, 2006). Population growth rates are also being affected; the total population of Swaziland is projected to increase to 1.58 million by 2105, 41% below the expected number in the absence of AIDS (Government of the Kingdom of Swaziland, 2006).
- The social structure of households is changing. The number of children under the age of 18 who have been orphaned, or who are socially and economically vulnerable due to serious illness of a parent (OVCs), estimated at 31.1% in 2006/07, is increasing. Role models within the family are also changing, with many single parents and OVCs acting as head of household.
- Poverty is pervasive, with a large percentage of the population living below the poverty line. Apart from a decline in remittances through decreasing numbers of migrants working in South Africa, and long periods of drought, poverty is exasperated by factors relating to HIV/AIDS. On a household level poverty is both a determinant and consequence of HIV/AIDS[47] the death of income-earning members and high costs incurred for health care and burial contribute to the cycle towards greater indigence. Poverty also affects the response to HIV/AIDS; low food and nutrition levels (malnutrition/obesity from an unbalanced diet) make treatment difficult. Coping

46 www.undp.org

47 The Kingdom of Swaziland (2009).

mechanisms are also under pressure; a large percentage of households have to take care of chronically ill people or OVCs, placing further financial burden on those members who are caregivers and/or the primary, or only, income source.

- HIV/AIDS is having an economic effect on government expenditure, with the budget having to contribute to the cost of prevention and cure. In the health sector, preventative and curative services are under stress, with increasing demands due to AIDS-related illnesses; as evidence, a high proportion of admissions (60%) in hospitals in 2006 were due to HIV/AIDS.

The impacts of HIV/AIDS that specifically relate to the sugar industry include:

- Impact on labour and productivity, particularly labour loss through illness and death; workers taking time off sick, or being unable to perform active tasks and thus requiring allocation to lighter duties; and lack of available 'quality' labour (skilled/trained and unskilled) and 'quality' work. In the RSSC Newsletter *Sikhulile News*, the Managing Director stated: "The RSSC is already experiencing the negative impacts through increased medical costs, increased sick leave and reduced productivity"[48]. In the long term, increasing demands for able-bodied workers may not be met locally, and lower levels of production may compound increased poverty levels and food insecurity at the household level.
- Households who belong to Farmers Associations (FAs) may not have members available to represent them, or to contribute/work for the association. The consequence is that land may be taken away by family members or others who 'step in' as representatives (especially affecting OVCs).
- Women are more likely to be affected by risks associated with changes in society as a result of developments in the sugar industry. For example, the movement from subsistence to cash crop economy may place them in a vulnerable position, made more precarious if family members contract HIV/AIDS.
- Milling companies have to provide greater financial outlay and human resources to mitigate the effects of HIV/AIDS, for their employees and for surrounding communities, for food and medical benefits, clinic outreach, school feeding programmes, death benefits and training investment. Although FAs may not have direct social responsibility towards those affected by the virus, through their very nature they hold some accountability to their membership.

On the positive side, developments in the industry have: created an increased awareness of HIV/AIDS, through education programmes by the government, the sugar companies, and through projects; ensured greater access to health facilities, such as SWADE's contribution towards a pathology laboratory in Siphofaneni to test for HIV; and produced higher levels of disposable (cash) income, leading to improved nutritional levels and raising households' ability to finance medical care.

5.5.3 Expected impacts with implementation of the NAS

No NAS component has been implemented which directly impacts on HIV/AIDS.

A specific NAS measure proposes the establishment of an effective and continuous AIDS programme, and related AIDS (effects) mitigation measures. In the strategic response

48 *Sikhulile News*. The RSSC Newsletter. January/February 2010

measures of the NAS, the RDMU indicated that it will initiate a study to establish the impact of HIV/AIDS on the performance of the sugar industry.

In the second Annual Report of the RDMU (RDMU, 2010b), Annual Action Programme (AAP) 2010 provides for Support to Social Services and Infrastructure. Action to reduce the costs of social services had been a priority for the industry, and the EU financed a study in 2007 to identify actions for financing. Three strategies were mooted for social services: handing over to government, outsourcing to the private sector, or cutting costs through energy savings and efficiency. However, there was recognition that over the medium term government cannot take over services owing to financial and human resources constraints, and a strategy built on putting in place alternative institutional structures during the limited lifespan of the NAS was unrealistic. Rather, the NAS would focus on actions that mitigate recurrent or capital cost of social services to the industry. In the health sector, proposed actions were limited to minor upgrading of health facilities to combat resistant TB (as a disease linked to HIV/AIDS). This was on the basis that government lacks the financial resources to operate industry health facilities, and the rural location/demographic characteristics make them unattractive to the private sector (as outsourcing). Although it was expected that the quality of social services provided to the sugar-belt community be maintained at the current standards, education rather than health was given preference in 2010.

A possible focus of the MIP 2011-13 is to deliver institutional support that consolidates and extends activities of existing sugar sector bodies/institutions so as to ensure the long-term sustainability of initiatives. This includes the upgrading and adaptation of health facilities, to meet ongoing health challenges (HIV/AIDS, TB etc). In addition, the NAS promotes supporting an enabling environment to foster socio-economic development, and sees this being HIV/AIDS Testing, Counselling and Treatment by RSSC and Ubombo Sugar, and HIV/AIDS initiatives by various governmental bodies. However, there is no guarantee that the EU will endorse the inclusion of social services in the MIP, and that health will receive a budget allocation.

On a more general level the NAS indicates that it will support smallholder farmers in improving their farm operations, to improve efficiency and viability of existing farmers and facilitate the entry of new ones, which could include mitigating against the effects of HIV/AIDS. In addition, it supports the creation of additional structures/institutions/ programmes necessary for the successful implementation of the strategy, again possibly linked to HIV/AIDS.

5.5.4 Options to address the key aspect

Effective management of HIV/AIDS is the foundation of the control of the virus. It prevents the development to AIDS and related complications of the disease, and decreases the spread of the virus. Management is through:

- prevention, including education and voluntary testing;
- appropriate treatment;
- care and support measures.

Although interventions have been identified that assist stakeholders to effectively address the HIV/AIDS epidemic, it is important to focus on issues specifically related to the sugar industry. Activities include:

- Analysis of the national policy, regulatory and institutional framework to address HIV/AIDS-related challenges in the sugar industry; to assess what will work in the future, drawing on lessons learnt from past experiences.

- Analysis to determine risk/trends at organisational level as they relate to the sugar industry (e.g. statistical projections, Health Impact Assessments, research projects), including an analysis of stakeholder response to the possibility of risk. The effects of possible changes need be assessed, such as reduction in smallholder projects, mechanisation, and introducing different irrigation systems to reduce employment requirements and/or to alleviate the workload of those who are ill.
- In any analysis of the HIV/AIDS situation, it is critical to consider issues of gender, particularly as studies have shown that women and girl children are most vulnerable to infection. Concerns include high levels of violence against women and girl children, including sexual assault and rape, linked to HIV/AIDS[49].
- Mainstreaming HIV/AIDS in all activities, not only in sugar companies but also in the out-grower schemes. This will involve co-ordination of tasks and collaboration of effort in HIV/AIDS between all bodies operating within the industry – private, governmental and non-governmental, drawing on what is currently being undertaken, filling any gaps and ensuring no repetition.
- Greater investment in health services impacting on the sugar industry, with extended outreach in communities, and particularly to small-scale farmers. All service providers within the industry need follow standardised national protocols, in order to ensure adequate training of health providers and adequate treatment at all levels of the health care delivery system.
- Placing emphasis on VCT programmes, for the industry and those affected by HIV/AIDS within it, to be able to manage the disease; through knowing their status, workers can receive treatment timeously and effectively. According to the Swaziland Demographic and Health Survey (SDHS), the percentage of the adult population who were tested for HIV and knew their results in 2006 was 22% for women and 9% for men[50]. Although the health service is currently stretched beyond capacity, in order to raise the number of people who know their HIV status, the MoH has been involved in increasing HIV testing and counselling services at health facilities, utilising mobile outreach services in the workplace, and including rural communities in VCT[51]. Supplementary to this, through the Global Fund the MoH makes ART available to most in need.
- FAs to include aspects of HIV/AIDS-related organisational policies adopted by the private sector; for example, where those medically unfit are given light-duty tasks or trained to undertake other (newly created) activities.
- Implementation of AMS 16001, or a similar system based on South African National Standards (SANS) 16001/2007, across the industry. The impact on the workplace from high infection rates necessitates the management of HIV/AIDS as a risk to

49 Analysis of the Gender, Sex and Power Relations: The Relationship with HIV and AIDS, in: *Sekunjalo: Implementing CEDAW for National Development. Volume 1, Issue 2*. January 2009. Cofunded by the UNDP and the EU, Sekunjalo is a newsletter that details the activities of the gender programme within the Gender Coordination Unit (GCU), Ministry of Home Affairs.

50 Central Statistical Office (2007).

51 An article on 11 May 2010 (PlusNews) stated that, although mobile clinics for HIV patients have been benefiting communities in rural Swaziland, "tight budgets have scuppered plans to expand, or even sustain a fleet of just two vehicles" according to a representative of Swaziland Positive Living (SWAPOL), an NGO that provides mobile clinics donated by UNICEF. In theory, mobile clinics are unnecessary because the MoH's goal of having a medical clinic within 7 km of every dwelling has been achieved for about 95 % of the population. However, this can mean travelling for several hours, particularly difficult for ill patients – and many people cannot afford the bus fare, leading to people defaulting from taking their ARV medication. According to the UNDP, 80 % of rural Swazis live in chronic poverty, and on average it takes them two hours to reach a clinic.

sustainable business. Based on ISO 14001, on the premise that risks to employees and the environment occur owing to processes from within the business, AMS 16001 focuses on the risk of employees becoming infected at work. However, the majority of HIV transmissions occur outside the workplace. SANS 16001:2007 has been introduced to improve HIV/AIDS management in the workplace, and can be implemented in all workplace environments, including public, private and NGO sectors[52]. The standard consists of a set of absolute requirements for achieving specific outcomes through actions in line with the currently accepted best practice. For certification, these outcomes are objectively verifiable by auditors, who ensure that the company is adhering to its stated policy. Once certification is obtained, the company is expected to continuously improve upon what it has previously undertaken.

Swaziland is in a phase of high HIV prevalence and AIDS deaths; this can be minimised with sufficient resources. If no action is taken now, impacts will continue to grow, with major effects on the sugar industry. It is recommended that the following priorities be given, based on the activities described above:

- Studies focusing on the impact of HIV/AIDS on the industry, and in particular a cost-benefit analysis of mechanisation as a mitigating factor to possible labour-related shortages, for the mills and cane growers.
- Resources allocated to the identification and management of HIV/AIDS, with emphasis on VCT to be able to assess the extent of the problem, and specifically in relation to small cane-growers and FAs.

5.6 Key aspect 5: Emission of POPs from sugar cane burning and socio-economic implications of green cane harvesting (Medium Priority)

5.6.1 Current state

The Stockholm Convention on Persistent Organic Pollutats (POPs) aims to protect human health and the environment from POPs. Swaziland has ratified the Stockholm Convention, and as part of its commitments has an obligation to produce a National Implementation Plan (NIP) spelling out a plan to reduce POPs and achieve compliance with the Convention.

POPs constitute a class of organic compounds that are toxic, resist natural degradation, bio-accumulate and are transported through air, water and migratory species. They accumulate in the fatty tissues of living organisms and their concentrations increase higher in the food chain. Exposure to POPs has been associated with adverse health effects such as cancer, reproductive defects, immune system suppression, hormonal disruptions, etc.

The basis to measure toxicity of POPs is the Toxic Equivalent Factor (TEF). The most toxic and widely studied PCDD/PCDF ($C_{12}H_4Cl_4O_2$, or 2,3,7,8-tetrachlorodibenzo-p-dioxin) is given a TEF of 1, so the rest of the PCDD/PCDFs have a value corresponding to a fraction of one depending on their toxicity in relation to that of $C_{12}H_4Cl_4O_2$.

Emissions of POPs are measured according to their Toxic Equivalent Quantity (TEQ), which is the sum of all individual PCDD/PCDF concentrations multiplied by their specific TEF. The

52 See www.timbersa.co.za

annual release of these toxins are expressed in units of grams toxic equivalent per annum (gTEQ/a). These releases may be to air, water or land.

The Stockholm Convention makes a distinction between "intentional production and use" of POPs and "unintentional production". The unintentional production of POPs falls under Article 5 of the Convention, more specifically relating to PCDD/PCDF (Polychlorinated dibenzo-p-dioxins and dibenzofurans), HCB (Hexachlorobenzene) and PCB (Polychlorinated biphenyls). Sources of PCDD/PCDF, HCB and PCB include open combustion of biomass. Countries have to take measures to reduce the total releases derived from anthropogenic sources on the chemicals listed in Annex C of the Convention (i.e. PCDD/PCDF, HCB and PCB), *"with the goal of their continuing minimisation and, where feasible, ultimate elimination"*. Swaziland has to develop and implement an action plan to that effect.

Swaziland has prepared a PCDD/PCDF Inventory (Mathunjwa, 2009) and is in the process of preparing its NIP. The PCDD/PCDF inventory for Swaziland identifies open combustion of waste as the main contributor of unintended generation of POPs, accounting for 86% of total emissions (most of which were associated to rural areas). The second source of emissions is sugar cane burning, accounting for 8%, with other subcategories contributing less than 1% of the total.

For the calculations the Inventory considered a total area of burnt cane of 50,400 ha (2006/07 data), and an average density of trash and tops burnt of 17.5 t/ha[53], giving a total of 882,000 t of burned biomass in 2006. The PCDD/PCDF Inventory gives a production of 9.261 gTEQ/a. This estimate makes use of the UNEP (2005) emission factors of 0.5µg TEQ/t of released into air and 10 µg TEQ/t for releases onto land. Thus out of the 9.261 gTEQ/a, 95.2% are releases onto land and the rest into the air.

These estimates considered the until-recently scenario, where 100% of the fields practiced Burnt Cane Harvesting (BCH), i.e. around 52,000 ha.

Various factors – economic, technical, social, and environmental – intervene in deciding whether to harvest cane green or burnt. These are summarised in Table 15 below. In the case of Swaziland BCH is the standard practice, although the added value of tops and trash as fuel for co-generation of electricity is producing a shift in preferences by the sugar companies. Future pressure may result from policy commitments to reduce the emission of POPs from cane burning in the context of the NIP to the Stockholm Convention.

53 This estimated density of biomass was obtained by the consultants from empirical data from the Philippines (Mendoza *et al*, 2002) and is consistent with data from Ubombo Sugar. The UNEP Toolkit suggests another emission factor based on tonnes of sugar produced which, if applied, gives total emissions significantly lower. Nevertheless, since the density of biomass used in the inventory is consistent with empirical evidence in Swaziland, we consider it a better approximation.

Table 15: Synthesis of advantages and disadvantages of BCH and GCH

Advantages	Disadvantages
Burnt Cane Harvesting (BCH)	
Faster cutting than GCH (1.5x)	Emission of POPs
Lower haulage costs (reduced trash content); greater payloads in haulage vehicles	Nuisance from smoke, health effects
Fires chase out snakes in fields	In intense fires, cracks in outer rind allow microbe entry, hastening post harvest deterioration and increasing dextran formation
Less extraneous matter (EM) levels than with GCH	Must be cut in less than 48h, juices dilute and no additional sugar formed
	Increased kill-to-mill time (KTM) in order to allow ash to cool, compared to GCH
	Difficult to match quantity burned to availability of cutters and factory capacity
	Volatilisation of N, S and C
	Fire destroys beneficial micro-organisms and earthworms in surface layer
	Reduced organic matter in soil, soil friability and porosity
	Reduced capacity of soil to hold nutrients in root zone
Green Cane Harvesting (GCH)	
Trash can be used for mulching: increases water retention, reduces irrigation water needs, partially contributes to climate change adaptation, weed suppression	Slower harvesting if manual cutting used
If tops and trash used for co-generation: reduced carbon consumption, reduced emissions of GHG, energy efficiency, reduced dependency on import of energy, potential increased income for farmers	More expensive haulage costs, lower payloads in haulage vehicles
See disadvantages of BCH, which would be advantages of GCH	More EM levels

5.6.2 Expected impacts in absence of the NAS

The NAS and other industry measures related to cane harvesting methods and expansion of areas under sugar cane have been studied to a large extent and some are already being implemented (expansion of sugar cane farming), whilst others are already following their course towards full implementation (changes in cane harvesting methods at the mill estates). Thus it is not relevant to consider a hypothetical scenario “in absence of the NAS”.

5.6.3 Expected impacts with implementation of the NAS

The implementation of the NAS is triggering two factors that will have opposite effects on the production of POPs from sugar cane burning. On the one hand the expansion of lands under sugar cane, especially under the LUSIP and KDDP schemes, will result in an increase in cane burning, and thus an increase in the generation of POPs. On the other hand, the move towards higher co-generation of electricity using cane tops and trash for self-consumption (RSSC and Ubombo Sugar) and for selling electricity to the national power grid under Power Purchasing Agreements (PPA) (Ubombo Sugar) will result in a decrease of cane burning at the mill estates.

5.6.3.1 Expected increase in sugar cane burning

LUSIP was expected to put a total of 11,500 ha under irrigation (6,500 ha in phase 1 and 5,000 ha in phase 2). Most of these lands will be dedicated to sugar cane. To date only 1,500 ha have been developed and a total of 3,500 ha are expected by 2012. Thus it does not seem that the full 11,500 ha will be developed.

On the other hand, KDDP is expected to develop 7,400 ha of irrigated farms, 5,500 ha of which for sugar cane. To date 3,700 ha have been planted to sugar cane.

It is estimated that 100% of the new lands will be under BCH, as at the moment there are no arrangements foreseen for the sugar mills to buy the tops and trash from the farmers. Estimating an additional 17,000 ha of sugar cane and the factor of 17.5 tonnes of biomass per ha, this gives us an additional 297,500 t of biomass burned. This corresponds to an additional 3.124 gTEQ/a (0.149 gTEQ/a of releases into the air and 2.975 gTEQ/a of releases onto land). Other factors remaining unaltered, new sugar cane lands under LUSIP and KDDP will increase the emission of POPs 33.7%, resulting in an increase in the contribution of cane burning to total emission of POPs from 7.9% to 10.6%.

On the other hand, if we consider a more realistic increase of land under sugar cane, considering 3,500 ha in LUSIP (rather than the originally planned 11,500 ha), adding KDDP the total additional land under BCH would be 10,900 ha. This corresponds to an additional 190,750 t of biomass burned, producing an additional 2.003 gTEQ/a (0.095 gTEQ/a of releases into the air and 1.908 gTEQ/a of releases onto land). The emission of POPs from cane burning would increase 21.6%, resulting in an increase in the contribution of cane burning to total emission of POPs from 7.9% to 9.5%.

The unintended generation of POPs due to the increased area of sugar cane under BCH would thus increase in the order of 22%-34% depending on the scenario and other factors remaining the same.

5.6.3.2 Expected decrease in sugar cane burning

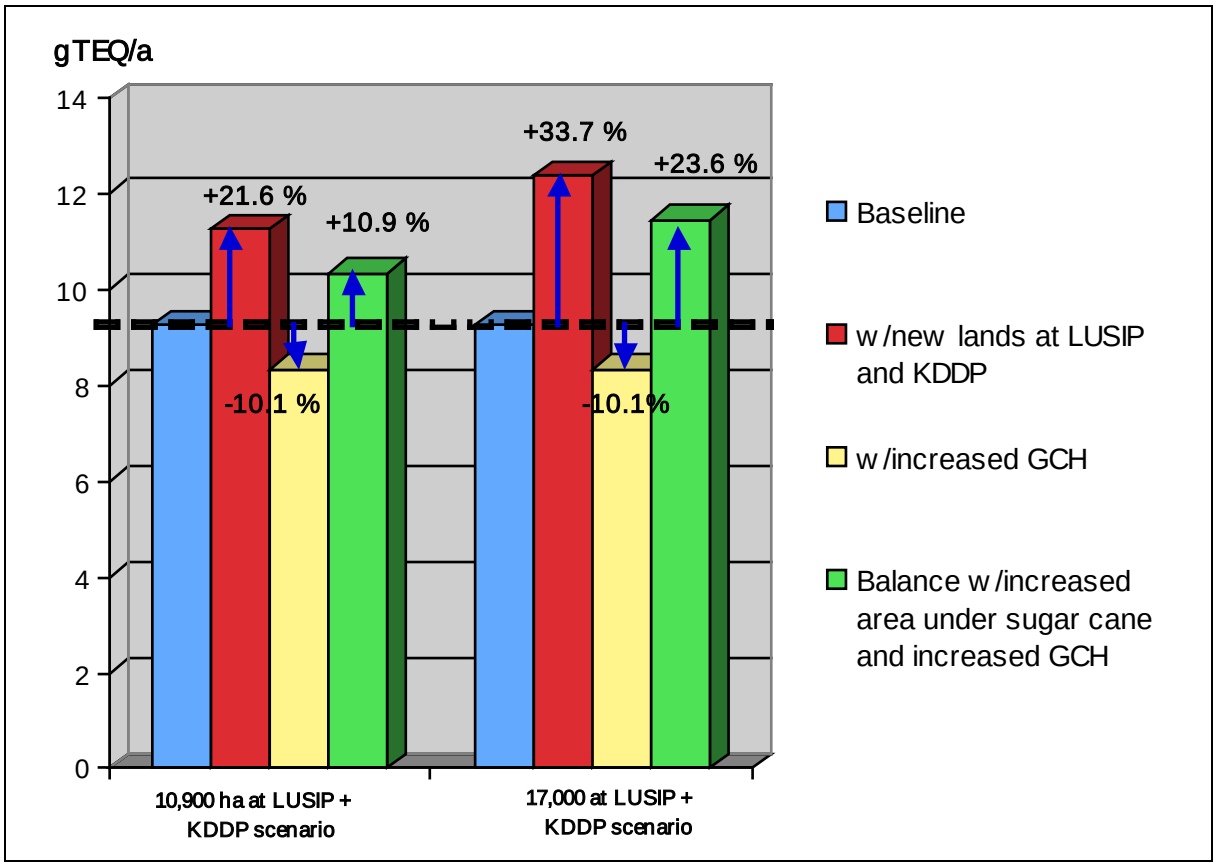
The NAS promotes increasing energy efficiency by increasing co-generation of electricity using cane tops and trash. This additional energy may be used to reduce dependency of the sugar mills on the power grid, but surplus electricity may also be sold to the national power grid acting as an Independent Power Producer (IPP) and through a PPA. Ubombo Sugar (Illovo) is working on the IPP option, whereas RSSC has plans to increase their co-generation capacity for their own consumption.

Ubombo Sugar has started to shift into GCH in 38% of their estate lands, which corresponds roughly to 3,105 ha. As far as RSSC is concerned, trials on GCH have taken place since 2008 (1000 ha in 2008, 70% choppers and 30% manual cutting; 700 ha in 2009 and about 2000 ha foreseen for 2010, all manual cutting).

Considering an approximate total of 5,100 ha of sugar cane going into GCH, this would represent a reduction in the generation of POPs in the order of 0.937 gTEQ/a (0.045 gTEQ/a corresponding to emissions into air and 0.893 gTEQ/a of emissions onto land).

Considering the increase in area under BCH due to the expansions at LUSIP and KDDP, and the reduction of emissions from land moving into GCH at RSSC and Ubombo Sugar estates, the balance indicates a net increase in the order of 1.006 gTEQ/a, which corresponds to a 10.9% increase from the baseline indicated in the inventory. Under the scenario where an additional 17,000 ha will be put under sugar cane at LUSIP and KDDP, the increase in the emission of POPs would be of 23,6% (net increase of 2.187 gTEQ/a).

Figure 22: Changes in emission of POPs with increased land under BCH from SCG and increased GCH at mill estates



An additional 5,800 ha of sugar cane would need to go into GCH only to return to the baseline levels for emission of POPs.

GCH in Ubombo Sugar will most likely be done using mechanical chopper harvesters; this would imply a proportional reduction (38%) in labour from cane cutters. As for RSSC their preference is for manual green cane cutting, for which they have carried out pilot trials. As green cane cutting is a more strenuous task than manual BCH, cane cutters would have a premium for GCH, which would have to be passed on to the cane cutters by the outsourcing company.

5.6.4 Options to address the key aspect

Cane burning being the second source of unintended generation of POPs, Swaziland must make a commitment, through its NIP, to reduce cane burning.

Thanks to the promotion of co-generation of electricity using tops and trash, and the opportunities opened for PPAs, a shift is taking place in the sugar mill estates towards GCH. Apart from the reduction in POPs and the agronomic advantages of GCH (see Table 15), increased co-generation will also have positive effects on reducing energy dependency, reduced use of coal and reduced atmospheric emissions.

BCH will most likely be substituted by manual GCH in the case of RSSC, and mechanised choppers in the case of Ubombo Sugar. These alternatives will have different socio-economic effects. In the case of RSSC cane cutters will be offered a premium for cutting green cane, whilst in the case of Ubombo Sugar there will be a reduction in the need for cane cutters (i.e. loss of employment opportunities).

On the other hand, expansion of areas under sugar cane due to new schemes under LUSIP and KDDP will imply more cane burning, and thus an increase in the generation of POPs, offsetting the reductions at the mill estates. For the time being mill estates have not expressed an interest in buying the tops and trash from small cane growers. The practice of GCH is not economically attractive for small cane growers, as it represents more labour for cane cutting and increased cost of transport. The advantages of GCH will not offset the disadvantages.

The following measures should be explored to address the environmental and socio-economic impacts of cane burning:

- Ensure that premiums offered to manual cane cutters are agreed with them, and adequate mechanisms set up to ensure these are transferred to the cane cutters by the outsourcing companies.
- Carry out an assessment of the economic value of GCH for small cane growers, taking into account savings in agrochemicals (due to weed control provided by mulching), higher sucrose content in cane delivered to mills (due to reduced KTM), and water and energy (irrigation) savings (considering also the future cost of water), as well as the increases in cost of transport and cane cutting. Such a study would provide the basis either to encourage GCH (if there are cost savings), or identify the incentives that would be required for small cane growers to shift to GCH (e.g. transport subsidies) in the context of efforts to reduce generation of POPs.
- Linked to the study above, carry out an assessment of the economic value of tops and trash for power generation, as a basis to negotiate a price at which tops and trash could be purchased from small cane growers for its use in co-generation at the mills.

5.7 Key aspect 6: Water pollution from agricultural run-off / monitoring of water quality (Medium Priority)

5.7.1 Current state

Sugar cane farming, as most intensive agricultural practices, makes use of a series of agrochemical products which serve different functions, e.g. fertilisers, ripeners, herbicides, insecticides, fungicides. These products may eventually find their way into water bodies and aquifers, where they take the form of pollutants. There are two main mechanisms through which agrochemical products may end up in water systems: run-off and leaching.

The main polluting agents are nutrients (mainly nitrates and phosphates derived from fertilisers), agrochemical products (e.g. pesticides, herbicides), and sediments from soil erosion.

Many factors intervene in determining the impacts of agriculture on water quality, e.g. amount of product applied in relationship to absorbing capacity; form of application (e.g. application of fertiliser through a drip system will minimise run-off); soil characteristics (type of soil, compaction, erosion); irrigation system in use; drainage systems; distance to water bodies; presence of riparian vegetation; rainfall (periodicity, volume and intensity); time of application (applications during the dry season will have less impact) and properties of the pollutants (more soluble components such as nitrate and sulphate tend to be more mobile, whilst less-soluble ones like phosphate and ammonium are relatively immobile through leaching).

Run-off refers to surface drainage, whereas leaching refers to subsurface drainage. In the case of subsurface drainage, it is the soluble chemical products (leachates) that are carried, affecting chemical composition of deeper soil strata or groundwaters, or flushing these pollutants into waterways.

As well the degree of contamination of water bodies will depend on the physico-chemical characteristics of the products used (e.g. toxicity levels, oxygen demand) and the dilution provided by the receiving water body. Table 16 below shows the agrochemical product components commonly used in sugar cane farming in Swaziland.

Table 16: Agrochemical components commonly used in the Swazi sugar industry

Ripeners	Garlon 4 (triclopyr)	Velpar DF (hexazinone)
Ethrel (Ethepon)	Gramoxone (paraquat)	Veloxytril (ioxynil+bromoxynil)
Fusilade Forte (fluazifop-P-butyl)	Hexazinone	**Fertilisers**
Volley 125EC	Lumax (mesotrione+S-metol.+terbuthyl)	**Organic**
Fungicides	MCPA (methoxone)	Green manure crops
Eria (limited use)	Merlin (isoxaflutole)	Stillage
Herbicides	Metrad (diuron + metribuzin)	Mill ash
Acetochlor	Metribuzin	Kraal manure
Alachlor	MSMA	Chicken manure
Ametryn	Parabat 500 + Extreme Plus (pendim+chlori-ethl-metribuzin)	**Inorganic**
Atrazine	Pendimethalin	Ammonium sulphate
Authority (sulfentrazone)	Roundup (glyphosate)	Di-ammonium phosphate
Diuron	Servian (halosulfuron)	Mono-ammonium phosphate
Eptam Super (EPTC)	Tebusan (tebuthiuron)	Muriate of potash
Extreme Plus (chlorimuron-ethyl + metribuzin)	Terbo (terbuthylazine+bromoxynil)	Potassium chloride
Falcon Gold (metolachlor)	Tolla (metolachlor)	Single superphosphate
Fusilade Forte (fluazifop-P-butyl)	Touchdown Forte (glyphosate trimesium)	Urea

The Figures below show the toxicity levels, leaching potential and human risk for herbicides commonly used in sugar cane farming.

Figure 23: Toxicity, leaching potential and human risk for herbicides commonly used in sugar cane farming

DEFINITIONS OF RISK TO HUMAN HEALTH (LABEL BAND COLOUR) AND SCORES FOR ENVIRONMENTAL RISK (LEACHING POTENTIAL AND EFFECT ON ANIMALS)

Risk to humans	Environmental risk		
	Category	Score	Definition
Toxicity to humans is in three ways: 1) by mouth (oral), 2) through the skin (dermal) or 3) through the nose (inhalation) **Herbicides are classified into colour bands on labels according to their LD50 toxicity:** **Class 1 - Red band** = highly toxic, requiring extreme caution **Class 2 - Yellow band** = toxic and described as harmful **Class 3 - Blue band** = toxic with caution required **Class 4 - Green band** = relatively safe herbicide Refer to the Table on page 59 for colour banding of herbicides. Remember that all herbicides are toxic even if they belong to Class 4, and must be used according to the precautions stated on the label. Each grower should be familiar with the herbicides used and remedies for accidental intake by operators. In case of accidents, contact the poison control centre at: **082 911 (Netcare)** **St Augustine's Hospital Poison Centre 0800 333 444**	GUS sand or clay	1 2 3 4	Low leaching potential. GUS = -0.6-0.5 Medium leaching potential. GUS = 1.0-1.8 High leaching potential. GUS = 1.9-2.8 Very high leaching potential. GUS = 2.8-10.0
			Water bodies - label states use restriction of the herbicide within a certain distance of dams, rivers, boreholes.
		1 2 3 4	Low toxicity to mammals (ORAL LD50 2000-8000 mg/kg) Medium toxicity to mammals (ORAL LD50 1000-2000 mg/kg) High toxicity to mammals (ORAL LD50 280-1000 mg/kg) Very high toxicity to mammals (ORAL LD50 48-160 mg/kg)
		1 2 3 4	Low toxicity to birds (LD50 2000-20000 mg/kg) Medium toxicity to birds (LD50 900-2000 mg/kg) High toxicity to birds (LD50 200-900 mg/kg) Very high toxicity to birds (LD50 75-200 mg/kg)
		1 2 3 4	Low or no toxicity to bees (LD50 1000 ug/BEE - NON TOXIC) Medium high toxicity to bees (LD50 70-1000 ug/BEE) High toxicity to bees (LD50 50-70 ug/BEE) Very high toxicity to bees (LD50 11-50 ug/BEE)
		1 2 3 4	Low toxicity to fish (LC50 1800 mg/L - NON TOXIC) Medium toxicity to fish (LC50 50-300 mg/L) High toxicity to fish (LC50 1-20 mg/L) Very high toxicity to fish (LC50 0.023-1.0 mg/L)
		1 2 3 4	Low toxicity to Daphnia (LC50 900 mg/L - NON TOXIC) Medium toxicity to Daphnia (LC50 45-300 mg/L) High toxicity to Daphnia (LC50 4-25 mg/L) Very high toxicity to Daphnia (LC50 0.11-4.0 mg/L)
	X		**Avoid roots** - the label stipulates that the herbicide should be used away from root zones of neighbouring plants.

* Human toxicity is based on LD50 values. LD50 = the dose lethal to 50% of the test animals, usually rats.
** Animal toxicity is based on LD50 or LC50 values = the concentration of herbicide in the air, water or diet that will kill 50% of the test animals.

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Herbicide		Human risk	Environmental risk								
			Leaching potential			Toxicity to terrestrial and aquatic environments					
Trade name	Active ingredients	Label colour band	GUS sand	GUS clay	water bodies	X					
Atrazine	atrazine	Yellow	4	3	X		2	2	1	3	2
Authority	sulfentrazone	Blue	3				1	1		2	2
Diuron	diuron	Green	3	3		X	1	2	1	3	3
Eptam Super	EPTC	Yellow	2	1			2	1	4	3	
Extreme Plus	chlorimuron-ethyl + metribuzin	Blue	4			X	2	4		2	3
Falcon Gold	metolachlor	Yellow	4				1	1	2	3	3
Fusilade Super	fluazifop-P-butyl	Yellow	1	1	X		1	1	2	3	3
Garlon 4	triclopyr	Yellow	3	2			2	2	2	2	2
Ametryn	ametryn	Yellow	4	2			1	1	2	4	3
Glyphosate	glyphosate	Green-blue	1	1			1	1	1	3	3
Gramoxone	paraquat	Yellow	1	1			3	3		3	3
Acetochlor	acetochlor	Blue		1			1	2	1	3	3
Alachlor	alachlor	Yellow	4	3			1	1	2	2	4
Lumax	mesotrione+S-metol.+terbuthyl.	Yellow	4				1	2	1	3	2
MCPA	MCPA	Yellow	2	1			3	3	1		2
Merlin	isoxaflutole	Green	4	1		X	1	1	2	2	3
Metribuzin	metribuzin	Yellow	4	1			2	3	2	2	3
MSMA	MSMA	Yellow	4	1			3	2	2	1	2
Parabat 500+Extreme Plus	pendim+chlori-ethl+metribuzin	Yellow	4			X	2	4	2	4	4
Pendimethalin	pendimethalin	Yellow	1	1			1	2	2	4	4
Servian	halosulfuron	Green	4				1	1	2	2	2
Tebusan	tebuthiuron	Yellow	4		X		3	2	1	2	2
Terbo	terbuthylazine + bromoxynil	Blue	4	1	X		1	4	3	4	4
Touchdown Forte	glyphosate trimesium	Blue	1	1			1	1	2	2	2
Velpar DF	hexazinone	Yellow	4		X	X	3	1	1	2	2
Voloxytril	ioxynil + bromoxynil	Yellow		1			4	4	2	4	4

Source: South African Sugar cane Research Institute, Herbicide Guide, July 2008.

The legal responsibilities for the monitoring of water quality are not clearly defined. According to the Water Act (2003 – Art. 33(7)(g)) the River Basin Authorities (RBAs) are responsible "*to monitor and control water quality and enforce effluent regulations*". However, these duties and functions of the RBAs are yet to be established by the minister.

Before the RBAs become fully functional, it is the Water Resources Branch in the Department of Water Affairs (Ministry of Natural Resources and Energy) that has the responsibility for the monitoring of water quality. Unfortunately no publicly available water quality reports have been produced, and the StrEA team was not able to identify the water quality monitoring data produced by the DWA. The State of the Environment Report for Swaziland (2001) points out to water pollution from industrial activities, although with no reference to agricultural runoff or the sugar industry.

Under the Water Pollution Control Regulations (2010) - which fall under the Environment Management Act (2002) – every "*water authority that has a duty to monitor water quality*" has to advise the "Authority" (i.e. the SEA) in case of non-compliance with the water quality objectives (Art. 3.2); as well, they have to produce an annual report to the Authority concerning the quality of water bodies under their jurisdiction (Art. 3.4). A "*water authority*" is defined as "*an authority which is legally responsible for monitoring or controlling water quality and without limitation, includes the Water Apportionment Board, the National Water Authority, River Basin Authorities and the Geological Survey and Mines Department of the Ministry of Natural Resources*".

In this context the RBAs will have to start engaging in monitoring of water quality and reporting findings. This has not yet occurred and there is a gap on water quality data for Swaziland.

Some sources of information on water contamination from agricultural run-off can be gathered from other sources, such as a study carried out by RSSC (Mhlanga *et al*, 2006) and the monitoring carried out by SWADE for LUSIP according to the CMP.

The water quality in the rivers that traverse the sugar cane areas (i.e. Usuthu, Mbuluzi and Komati) has been decreasing at an alarming rate, according to various independent studies[54]. The above study, which looks into the impacts of irrigation return flows from RSSC on the quality of receiving waters in the Mbuluzi River Basin, concludes that "*return flows from sugar cane irrigated fields at RSSC discharges into the Mbuluzi River contribute to elevated pollution levels as observed in the water quality status of the field drainage streams*", and that the effect of return flows on water quality is influenced by the amount of water flow. The main contaminants include Total Dissolved Solids (TDS), sodium, Suspended Solids (SS), electroconductivity, magnesium, calcium and sodium adsorption ratio (SAR). Nevertheless pollution in the Mbuluzi River would only occur during low flows, as otherwise the River has a large dilution capacity.

5.7.2 Expected impacts in absence of the NAS

The main factor influencing water contamination associated to the sugar industry is the expansion of lands under sugar cane, which is already taking place and will continue. Thus it does not make sense to consider a hypothetical case where no expansion takes place.

54 Dlamini, MN (2004) *An investigation on the quality, pre-treatment and impacts of effluent from Sappi-Usuthu Pulp Mill in the great Usuthu River*, Unpublished MSc Thesis, Department of Civil Engineering, University of Zimbabwe; JTK Associates and Knight Piesold Consulting Engineers (2002) Water availability in the Mbuluzi River Basin, Mbabane, Swaziland; and Muthimkhulu, S (2004) Biological assessment of the state of the water quality using the South African Scoring System (SASS); a case of the Mbuluzi River, Swaziland. All cited in Mhlanga *et al*, 2006.

The second factor influencing water contamination associated to the sugar industry is the practices for the application of agrochemical products by existing farmers. These are not expected to change significantly as water contamination from agricultural run-off has not been perceived as an issue, either by the industry itself or by the competent authorities.

5.7.3 Expected impacts with implementation of the NAS

Expansion of lands under sugar cane implies a larger use of agrochemical products, and thus an increase in run-off into the aquatic system. As seen above many factor come into play in determining the amounts of run-off and associated contamination.

Run-off of agrochemicals may increase, in a context of insufficient training on their adequate application by farmers, especially by new entrants who have no experience in sugar cane farming. Indeed training to new small cane growers remains insufficient (see Key Aspect 2 above) according to the perception gathered by the StrEA team through interviews, increasing the risk of contamination. Nevertheless there are training programmes through different institutions (e.g. SWADE, SSA, sugar mills) to further address this type of training to cane growers.

At the moment it is not possible to determine if water contamination from agricultural run-off and leaching is a real concern, as there is insufficient water quality monitoring data available. The little data that is available however, indicates that water contamination from agricultural run-off may indeed be an issue, threatening the achievement of water quality objectives.

Furthermore, according to climate change modelling, run-off in Swaziland's river basins is expected to decrease (see Key Aspect 1 above). This will imply a lower dilution factor by the receiving rivers, and thus an increase in the concentration of contaminants.

5.7.4 Options to address the key aspect

Actions should be taken to ensure that adequate and systematic monitoring of water quality takes place in Swaziland. This will be the only way to identify whether run-off of agricultural products from sugar cane fields is an issue that needs to be addressed.

The RBAs are now responsible for the monitoring of water quality (under the Water Act, 2003), who have an obligation to produce annual reports on water quality (reporting to the Swaziland Environment Authority, under the Water Pollution and Control Regulations, 2010), and to alert on situations of non-compliance with the water quality objectives.

At the moment any existing data on water quality in possession of the Water Resources Authority (with responsibility for water quality monitoring before competencies were shifted to the RBAs) has not been transferred to the RBAs. Furthermore the RBAs do not have the capacities (financial, human resources, technical) necessary to carry out systematic monitoring of water quality.

Appropriate support should be given to ensure RBAs become fully functional, effective and efficient bodies. This will require a needs assessment. Once regular and monitoring of water quality is taking place, will it be possible to confirm whether agricultural run-off from sugar cane farming is a true concern, and thus trigger necessary remedial actions, which could address issues such as training, design of drainage systems, and possible treatment of agricultural run-off.

5.8 Key aspect 7: Regulation of effluent discharges (Low Priority)

5.8.1 Current state

The Water Act (2003) establishes the bases for the regulation of water polluting activities (Part VIII on Control of Pollution), based on the use of Effluent Control Permits. Application for effluent control permits is done through the Water Apportionment Board, but these functions are now to be taken over by the River Basin Authorities.

Sugar mills are legally obliged to be in possession of an effluent control permit, as they undertake industrial processes. At the moment effluent control permits are being issued by the Dept of Water Affairs on behalf of the RBAs, whilst the RBAs become fully functional and assume greater management and control of water in their basin.

Both sugar companies seem to have maximised reuse of water within their factory operations, however, there is still some that enters the environment.

RSSCs mill in Mhlume has an anaerobic and aerobic digestion systems, combined with wetlands and use the final (treated) effluent for irrigation in their estate; in the future the Mhlume mill will increase the area of reuse of the final effluent used for irrigation of sugar cane fields, and is aiming for zero discharge (i.e. 100% reuse). In the case of the Simunye mill, a series of anaerobic and aerobic ponds are in place as well as a constructed wetland. Ubombo Sugar also has waste water treatment systems in place, and uses all of the (treated) effluent for irrigation in the sugar cane fields.

Currently there are allegedly no major concerns with regards to water pollution from sugar mill effluent discharges, but risks of spillage from broken treatment systems are always present.

Figure 24: Sugar mill effluent and treatment

Under the Water Pollution Control Regulations (2010), anyone that discharges or permits the discharge of effluent "directly or indirectly" into a water body, must comply with the Effluent Standards (defined in Schedule 2 of the Regulations). Sugar mills thus have an obligation to regularly sample and test their effluent discharges for all regulated parameters and substances the first time they do the testing and then annually, and on a monthly basis only for those parameters and substances known to be in the effluent. Records must be kept,

including of the volumes of effluent discharged. The results of the tests must be submitted to the SEA. The regulations are not clear on how the SEA will use or interpret the results or even how the results will be stored (paper or electronic database), and who can have access to those results.

Significantly there is no link between the effluent standards and the effluent control permits (under the Water Act).

5.8.2 Expected impacts in absence of the NAS

As all expansion plans are already underway at the sugar mills (e.g. increased crushing capacities) to cater for LUSIP and KDDP production, it is irrelevant to envisage a scenario where the NAS is not to be implemented.

5.8.3 Expected impacts with implementation of the NAS

An increase in sugar production, as envisaged in the NAS, will result in an increase in the generation of industrial effluents at the sugar mills.

At the moment the three existing sugar mills have effluent treatment systems in place and according to the results of interviews with stakeholders, there does not seem to be an issue with water contamination from effluent discharges. However, as all treated water is reused for irrigation, any high levels of pollutants not complying with the effluent standards, would end up mixed in the agricultural run-off. There is no indication on whether the treatment systems in place are adequate to handle any increases in volumes brought about by the expansion of the milling capacity of the mills.

The expanded sugar production is initially not expected to result in any significant increase of pollution levels, although risks may ensue if the treatment systems are not upgraded to deal with increases in effluent brought about by the expansion. It is important to ensure a closer control of effluents in the industry by the administration, through appropriate monitoring and implementation of the existing regulations.

The links between the effluent control permits and the effluent standards defined in the Water Pollution Control Regulations are an issue that would need to be addressed. This confusion may be increased when “effluent control regulations” are issued under the Water Act, which will allegedly be independent of the effluent standards and monitoring obligations under the Water Pollution Control Regulations.

5.8.4 Options to address the key aspect

The River Basin Authorities need to develop necessary capacities and secure the necessary resources to fully assume their broad suit of functions. These include the processing of applications for effluent control permits. The SEA, DWA and RBAs also need strategies on how they can best implement and monitor water quality in cooperation with the mills and develop modalities for exchanging information.

The Water Pollution Control Regulations (2010) must start to be enforced. This will allow the SEA to define a baseline with regards to the quality of effluents generated by the sugar factories, and the degree of compliance with effluent standards.

The agenda for the preparation of “effluent control regulations” under the Water Act must be coordinated to ensure it is fully linked to the Water Pollution Control Regulations and its

effluent standards. Otherwise there is a high risk of duplication of functions and possibly also contradictions, not to mention inefficiency in the regulatory efforts.

5.9 Key aspect 8: Regulation of atmospheric emissions (Low Priority)

5.9.1 Current state

Draft Air Pollution Control regulations were prepared in 1999, but it was not until 2010 that these were gazetted (The Air Pollution Control Regulations, 2010).

The Regulations establish air quality objectives, and it is the responsibility of the Meteorological Service to monitor air quality and assess compliance with the air quality objectives. The Regulations also include a list of "controlled air pollutants"[55], although no emission limits are established. There is also a prohibition to emit dark smoke (Art. 4).

The Regulations also establish that *"any operator who routinely emits into the atmosphere, or permits the emission into the atmosphere of, any controlled air pollutants must notify the Authority of the nature of the process being operated which gives rise to the emissions and of the actual or estimated quantity of controlled air pollutants emitted per annum and during peak periods"*. Sugar factories would definitely be considered such "operators".

Figure 25: Atmospheric emissions from the sugar production process

55 These are: SO_2, PM10, NO_2, O_3, CO, lead and "any other potentially toxic compound".

The sugar factories produce atmospheric emissions from their power generation process (boilers) using coal and bagasse. The pollutants emitted depend on a series of parameters, including the fuel used, the pollution control systems in place, and boiler pressure.

The boilers in the sugar mills use bagasse as their main fuel, although supplementary sources of fuel are used. All three sugar mills use coal as supplementary fuel (26,500 t/yr in Simunye, 26,372 t/yr in Mhlume, and 5,000 t/yr in Ubombo Sugar); as well the RSSC mills also resort to wood chips (28,618 t/yr in Simunye and 22,124 t/yr in Mhlume).

Figure 26: Coal reserves as supplementary fuel at the sugar mills

As the Regulations are very recent, the monitoring and reporting of atmospheric emissions has not yet taken place. Nevertheless, the inclusion of the category *"any other potentially toxic compounds"* as one of the "controlled air pollutants" under Schedule 2 of the Regulation, introduces an ambiguity and complication in determining what parameters must be monitored by the sugar factories.

5.9.2 Expected impacts in absence of the NAS

As all expansion plans are already underway at the sugar mills (e.g. increased crushing capacities), it is irrelevant to envisage a scenario where the NAS is not to be implemented.

5.9.3 Expected impacts with implementation of the NAS

Two NAS factors will have an influence in the amount of atmospheric emissions from sugar mills. The increase in sugar crushed will result in an increase in emissions; however, the increase of co-generation using tops and trash will reduce polluting emissions by reducing the amount of coal burned.

Atmospheric pollution does not seem to be an issue in Swaziland; however, emissions around Matsapha industrial estate and the cane mills do pose localised areas of high atmospheric pollution levels. Nevertheless there are opportunities to enhance its regulation and control, and guarantee compliance with international standards.

5.9.4 Options to address the key aspect

There are opportunities to enhance the regulation of atmospheric emissions. Mainly emission limits should be established in line with international standards, and the category of "any other potentially toxic compounds" should be avoided.

Once emission limits are established, then mechanisms should be created to ensure the competent authority has authority over the operation of air polluting industrial activities (e.g. through atmospheric emissions permits).

5.10 Other aspects

5.10.1 Positive impacts

The implementation of the NAS will produce a series of positive impacts as well. These are outlined below.

- All efforts at increasing **co-generation using tops and trash** will result in: increased energy efficiency; reduced dependency on imported energy; reduced atmospheric emissions and emission of GHG due to reduced burning of coal; and reduced emission of POPs due to reduced cane burning at the sugar mill estates. There is also an opportunity for small cane growers to increase their profits by selling their tops and trash to the mills for the production of electricity.
- Actions oriented to **reduce the debt burden** will have positive effects on poverty and sustainability of small scale sugar cane growers.
- Actions at **promoting fair trade** in the sugar sector will allow, if successful, to enhance the overall environmental and social management in the sugar sector, especially for small scale farmers. This enhanced management may result in benefits, e.g. related to water contamination from agricultural run-off, labour conditions, and general good environmental farm practices.
- The **improvement of transport infrastructure** has a potential to reduce transport costs, as long as mechanisms are in place to ensure that cost reductions are reflected in the transport fees paid by the farmers.

5.10.2 Other negative impacts

As well a series of other minor negative impacts may result from implementing the NAS. These are not to be neglected, but are not considered to be priority issues.

- Contamination and health issues associated to inadequate **management of hazardous waste** by cane producers, especially reuse of agrochemicals' containers, which are often used for carrying and storing drinking water.
- **Safety of field labourers** is a concern, and this may be aggravated with expansion of sugar cane. The shift to manual green cane harvesting will increase risk of accidents by cane cutters, who would have to be provided adequate protective equipment.
- **Soil salinisation** is a problem associated to inadequate irrigation and drainage. This has already been a problem in some lands under sugar cane, and should not be neglected, as inadequate monitoring may lead to drop of yields and risk of land abandonment.

6 INDICATORS

6.1 Analysis of NAS indicators

This section analyses the NAS indicators from an environmental point of view. The purpose of this analysis is to ensure that the proposed indicators are not linked to negative environmental effects (i.e. that pursuing a sectoral indicator may imply adverse indirect effects on the environment). The NAS document itself does not offer any indicators; this analysis is based on the indicators proposed for the revised Logical Framework.

For the purposes of this analysis, a series of "StrEA Objectives" are defined, reflecting the objectives that are pursued through the recommendations, and which are targeted to address the key aspects identified. The StrEA objectives used here for analytical purposes are as follows:

Objective 1a: Water balance in Swaziland's rivers is constantly positive and sufficient to cater for environmental services, international commitments with RSA and Mozambique, and agricultural, industrial and domestic water demand.

Objective 1b: Water balance in Swaziland's rivers will remain positive in the future to cater for water needs, taking into account the effects of climate change.

Objective 2: Small- and medium-cane growers maintain viable and profitable businesses.

Objective 3: Biodiversity is not compromised by sugar cane expansion.

Objective 4: HIV/AIDS associated to workers in the sugar sector is controlled and prevalence eventually reduced.

Objective 5a: The area under sugar cane burning is reduced.

Objective 5b: Cane cutters maintain or increase their income when engaged in GCH.

Objective 6a: Reliable information is regularly generated on the contribution of sugar cane farming to water pollution.

Objective 6b: The contribution of sugar cane farming to water pollution is not increased.

Objective 7: Reliable information is regularly generated on the contribution of sugar mill effluent discharges to water pollution.

Objective 8: Reliable information is regularly generated on air pollution from sugar mill atmospheric emissions.

As can be seen in Figure 27 below, many of the proposed indicators are actually positively correlated to environmental objectives promoted by the StrEA. Nevertheless, there are some indicators which are negatively correlated; this does not mean that they should not be used as indicators, but rather that care should be taken to ensure no significant impacts take place.

Table 17: NAS logframe indicators negatively correlated to environmental objectives

Indicator	Comments	Response
ha cane in the SSG sector (proxy for employment) Total hectarage in cane Area of land developed through co-financing of smallholder schemes	Putting more land under sugar cane will imply more water use in areas already under water stress, and where a decrease in water supply is expected from climate change. More cane farming will also imply more use of agrochemical products, which may contribute to water contamination. More ha under sugar cane will imply land clearance, often of indigenous vegetation.	Associated indicators on sustainable water use should be developed to keep negative environmental impacts controlled: e.g. Water use efficiency in sugar cane farming (Mm^3/TC), disaggregated by category of growers (small scale, medium scale, mill estate) % sugar cane under drip irrigation/ centre-pivot/ sprinkler/ furrow, disaggregated by category of growers The above indicators should be associated to objectives of water efficiency in the NAS.
ha and % of total cane burnt area	This indicator will help monitor area under BCH and advances in GCH. However, there is a risk for cane cutters, who may find their income affected.	This indicator should also be associated to an objective on reduced cane burning. Income of cane cutters under GCH should also be checked, with associated objective and indicators, ensuring there is no loss of income.
Yields: TC/ha, % sucrose	Increasing yields is normally achieved by increasing water availability (when not already available in sufficient quantities) and increasing use of agrochemical products. This has implications for water availability and water pollution (agricultural run-off). Other potential measures to increase yields and sucrose content do not correlate directly to negative environmental impacts, such as reducing KTM, cane varieties, transport cost.	Comments made above on indicators for water efficiency are also relevant here.
km of paved gravel road	Environmental impacts of paving roads are normally short-lived and localised.	It must be ensured that the indicator is not used to measure building of new roads, which would imply more significant environmental impacts. In any case, km of roads built should not be used as indicator, but rather a results-based indicator defined (e.g. associated to transport costs or KTM time).

Figure 27: Consistency analysis of NAS logframe proposed indicators with StrEA objectives

Indicator	Objective 1a: Positive and sufficient water balance	Objective 1b: Positive and sufficient future water balance in light of climate change	Objective 2: Viable small- and medium- cane growers	Objective 3: Biodiversity is not compromised by sugar cane expansion	Objective 4: HIV/AIDS in sugar sector controlled and eventually reduced	Objective 5a: Area under sugar cane burning reduced	Objective 5b: Cane cutters maintain or increase income with GCH	Objective 6a: Information generated on cane farming contribution to water contamination	Objective 6b: Contribution of cane farming to water contamination not increased	Objective 7: Information generated on mill effluent contribution to water contamination	Objective 8: Information generated on atmospheric emissions from mills	Other environmental aspects	Comments
Overall Objective: Swaziland's (export-led) economic growth is maintained or improved, creating employment and reducing poverty													
GDP per capita in PPP													Indirectly
GDP per capita in US$													Indirectly
Ntl' employment rate in formal sector													Indirectly
% Swazis living below E128/month poverty line													Indirectly
Purpose: A more competitive sugar industry continues to play its strategic multifaceted role, facilitating sustainable development in the Sugar Belt													
Sugar industry contribution to GDP in US$, Euros, a % of total													Indirectly
Sugar industry contribution to formal sector employment (% and total)													Indirectly
ha cane in the SSG sector (proxy for employment)													More ha imply more water use, cane burning, clearance of indigenous vegetation

Indicator	Objective 1a: Positive and sufficient water balance	Objective 1b: Positive and sufficient future water balance in light of climate change	Objective 2: Viable small- and medium- cane growers	Objective 3: Biodiversity is not compromised by sugar cane expansion	Objective 4: HIV/AIDS in sugar sector controlled and eventually reduced	Objective 5a: Area under sugar cane burning reduced	Objective 5b: Cane cutters maintain or increase income with GCH	Objective 6a: Information generated on cane farming contribution to water contamination	Objective 6b: Contribution of cane farming to water contamination not increased	Objective 7: Information generated on mill effluent contribution to water contamination	Objective 8: Information generated on atmospheric emissions from mills	Other environmental aspects	Comments
Changes over time in cost of services per tonne of sugar produced, disaggregated by sector													
Changes over time in enrolment and pass rate of 'matriculation' level students in sugar belt, compared with national figures in private and public schools													
Changes over time in numbers presenting for primary health care facilities and access HIV/AIDS and TB treatment disaggregated by sugar belt													
Annual sucrose price per tonne													Positive correlation when linked to objective of cost reductions
Yields: TC/ha; % sucrose													Higher yields may imply more use of water and agrochemicals
Total hectarage in cane													More ha imply more water use, cane burning, clearance of indigenous vegetation

Indicator	Objective 1a: Positive and sufficient water balance	Objective 1b: Positive and sufficient future water balance in light of climate change	Objective 2: Viable small- and medium- cane growers	Objective 3: Biodiversity is not compromised by sugar cane expansion	Objective 4: HIV/AIDS in sugar sector controlled and eventually reduced	Objective 5a: Area under sugar cane burning reduced	Objective 5b: Cane cutters maintain or increase income with GCH	Objective 6a: Information generated on cane farming contribution to water contamination	Objective 6b: Contribution of cane farming to water contamination not increased	Objective 7: Information generated on mill effluent contribution to water contamination	Objective 8: Information generated on atmospheric emissions from mills	Other environmental aspects	Comments
% energy produced by industry (megawatt hours)													More co-generation implies less burning of coal
hectares and % of total cane area burnt													If linked to objective of reducing burning. Cane cutters may be affected by reduced burning if their concerns not addressed.
Results													
1. NAS coordinated and implemented													
Value in € and timing of funding committed													
Value in € and timing of projects implemented													
2. Productivity and efficiency of sugar industry supported													
km of paved gravel roads													Env. impacts associated to road paving, usually localised and short-term. If road construction, then other impacts associated.

Indicator	Objective 1a: Positive and sufficient water balance	Objective 1b: Positive and sufficient future water balance in light of climate change	Objective 2: Viable small- and medium- cane growers	Objective 3: Biodiversity is not compromised by sugar cane expansion	Objective 4: HIV/AIDS in sugar sector controlled and eventually reduced	Objective 5a: Area under sugar cane burning reduced	Objective 5b: Cane cutters maintain or increase income with GCH	Objective 6a: Information generated on cane farming contribution to water contamination	Objective 6b: Contribution of cane farming to water contamination not increased	Objective 7: Information generated on mill effluent contribution to water contamination	Objective 8: Information generated on atmospheric emissions from mills	Other environmental aspects	Comments
Time taken from Cut to Crush													Indirectly. More sucrose and profits.
Transportation costs from field to mill													Linked to objective of reducing costs.
Educational trusts established become financially sustainable with precise agreed targets													
Contribution of industry to trusts													
Average SSG yields													
SSG indebtedness													
SSG profit and loss accounts													
Area of land developed through co-financing of smallholder schemes													More ha imply more water use, cane burning, clearance of indigenous vegetation
Total and % membership of SSGs in harvesting groups													

Indicator	Objective 1a: Positive and sufficient water balance	Objective 1b: Positive and sufficient future water balance in light of climate change	Objective 2: Viable small- and medium- cane growers	Objective 3: Biodiversity is not compromised by sugar cane expansion	Objective 4: HIV/AIDS in sugar sector controlled and eventually reduced	Objective 5a: Area under sugar cane burning reduced	Objective 5b: Cane cutters maintain or increase income with GCH	Objective 6a: Information generated on cane farming contribution to water contamination	Objective 6b: Contribution of cane farming to water contamination not increased	Objective 7: Information generated on mill effluent contribution to water contamination	Objective 8: Information generated on atmospheric emissions from mills	Other environmental aspects	Comments
3. Value added to industry products supported													
Refining capacity for higher value sugars													Indirectly
Bagging capacity for higher value sugars													Indirectly
% of total sugar sales certified Fair Trade													FLO regulates environmental management
% contribution of diversified revenue streams to total revenue													
4. Diversification supported													
Area in hectares returned from cane to other crops													Most crops would be less water-intense than sugar cane and no burning.
5. Market access, marketing and revenue enhancement supported													
Sales by type of products, volume and value to EU, SACU, US, COMESA and World Markets													

Positive impact; Negative impact, low significance; Negative impact, medium significance; Negative impact, high significance.

6.2 Proposed StrEA performance indicators

Performance indicators are proposed to measure adequate implementation of the StrEA findings. These are presented in Table 18 below. These indicators could also be used for measuring StrEA effectiveness.

NOTE: The indicators proposed below are devised for monitoring the implementation of the StrEA findings. They are NOT NAS performance indicators. Several of the recommendations in the StrEA fall beyond the scope of the NAS, and imply actions by institutions/actors outside the NAS SC. For this reason some of the indicators proposed measure actions beyond the scope/control of the NAS and the NAS SC, and cannot be linked to performance of the NAS.

Nevertheless, it should be the role of the NAS SC to monitor the implementation of the StrEA recommendations. Responses to inadequate performance may imply that the NAS SC should strengthen its policy dialogue with the relevant institutions, to further promote their implementation.

Table 18: Proposed StrEA performance indicators

Indicator	Measurement	Observations
Water availability / climate change		
RBAs fully assume functions on water allocations	Systems in place to assess water demand and issue water permits	Inadequate basin-wide data currently exists. Each basin to audit its water flows, storage, demand and use.
Water balance is prepared for the five river basins, integrating future water demand and expected decreased run-off due to climate change	Water balance report	Inadequate water measuring information hampers developing useable records. Basin-wide assessments are required.
Energy use efficiency in sugar cane farming (kWh/m^3/ha)	Information provided by all cane growers Energy use bills Water abstraction volumes[56]	Measurement of energy used to pump water is available through SEC billing. Methodologies for standardising energy use and reporting will be required. The financial cost of energy to pump irrigation water is increasing rapidly. Many improvements are possible with the electrical equipment used to make financial savings.
Water use efficiency in sugar cane farming (Mm^3/ha)	Information provided by all cane growers Water abstraction volumes	Measurement of water abstracted is erratic and inconsistent. Methodologies for standardising abstraction measuring and reporting will be required. Periodic irrigation efficient assessments to be undertaken at field level. Standardised methodologies exist for this.

56 Water Act section 37(9) "A permit to divert or use water for agricultural or industrial purposes or for a local authority shall require the permit holder to install and maintain adequate devices to measure and record the flow rate and volume of water diverted or used".

Indicator	Measurement	Observations
% sugar cane under drip/ centre-pivot/ sprinkler/ furrow	Information provided by all cane growers or supporting institutions, e.g. SSA, mill groups	Some growers still use flood forms of irrigation, which is highly inefficient. Greater effort is needed to convert such areas to overhead or drip systems.
Industry exposure to adverse impacts of climate change reduced	Through assessment and assessment reports National water balance reports	
Long-term socio-economic and environmental sustainability of small cane growers		
Evaluation of management models for small cane growers currently promoted by developers	Evaluation report	Information obtained through a public participation process at all levels Information provided by cane growers, Millers and project developers (e.g. SWADE) To ensure that the different management models are presented before informed decisions are made SWOT analysis of current models, and comparing the models with other options
Designation of organisation to manage training offered to small cane growers		Information provided by all training institutions Organisation allocated the task is to determine if the training is appropriate to requirements, is of a high level, is standardised, and is being implemented
Needs assessment of farmers around management and other farming requirements	Needs assessment report	Information provided by all cane growers
Topic/number of days of training given to farmers; number of farmers who participated	Information provided by cane growers and training institutes	
% allocation of portions of land to small cane growers for alternate cropping	Information provided by all cane growers and project developers	
Area (ha) under alternate cropping (total, %)	Information provided by all cane growers and project developers	
Cost-benefit analysis of the socio-economic impacts of increased mechanisation is carried out	Cost-benefit analysis report	Information provided by Ministry of Finance Relate this study to HIV/AIDS Emphasise impact on income and hence cash flow

Indicator	Measurement	Observations
Loss of biodiversity due to land-take for sugar cane expansion		
Implementation of biodiversity impact assessments for new cane growing areas	Biodiversity impact assessment report	Project focused environmental assessments overlook the cumulative impacts on biodiversity losses and impacts
Capacity and commitment to independently monitor the implementation of the various mitigation plans improved	Increased number of Project Compliance Reports and site visit reports	Inadequate compliance and monitoring has allowed unsustainable practices to take place
Livestock resettlement plans prepared	Livestock resettlement plans submitted	Displacement of livestock grazing areas places greater pressure on neighbouring lands. Poor levels of livestock off-take results in increasing densities of livestock grazing finite areas.
Biodiversity corridors and areas of high biological diversity identified and protected	Number and size of biodiversity corridors and areas of high biological diversity established and protected from agricultural development	Fragmentation of habitats in cane growing areas is a cause of great concern to nature conservationists. Biodiversity corridors and areas of high biological diversity can mitigate for wider biodiversity loss and facilitate an improvement in biodiversity conservation
Protected areas protected from cane husbandry activities	Reports from protected area managers on frequency and impact of cane husbandry practices, e.g. drift from aerial application of agro-chemicals	
Capacity and commitment to independently monitor the implementation of the various mitigation plans improved		
Research on the impact of HIV/AIDS on the sugar industry is carried out	Research report	Report possibly coordinated by/with the support of NERCHA Information provided by NERCHA, MoH (SNAP and local health centres), Millers, and project developers (e.g. SWADE) Report from RSSC on aspects of HIV/AIDS as it relates to the company To include cost-benefit analysis of mechanisation, which will link in with affects of mechanisation on long-term viability of small cane growers

Indicator	Measurement	Observations
HIV/AIDS-specific services offered by health centres in impacted areas	Information provided by MoH (particularly local health centres) and Millers	To include number/level of education of health professionals and other health workers; type/extent of awareness programmes; treatment on offer; and type/extent of care and support measures Services to include treatment for TB
Numbers of people tested through VCT in impacted areas, according to occupation and gender	Information provided by MoH (particularly local health centres) and Millers	
Numbers receiving ARVs and ART in impacted areas, according to occupation and to gender	Information provided by MoH (particularly local health centres) and Millers	
% of FAs implementing AIDS-related policies within their organisation	Information provided by project developers, FAs, and Millers Outgrowers Departments	Emphasis on type/extent of awareness and education campaigns around HIV/AIDS
Emission of POPs from sugar cane burning and socio-economic implications of green cane harvesting		
Area (ha) under BCH (total, %)	Information provided by all cane growers	
Average income of cane cutters engaged in BCH in relation to those engaged in GCH	Surveys with cane cutters	
NIP to the Stockholm Convention includes strategy to address reduction of cane burning, developed with and agreed by NAS SC members	NIP document	
Water pollution from agricultural run-off / monitoring of water quality		
RBAs effectively assume water quality monitoring functions	Water quality monitoring reports generated by RBAs	
Monitoring system for river water quality is developed by the RBA	Water quality monitoring plans for each RBA	Monitoring system to include: defining sampling points that allow measuring contribution of agricultural run-off from sugar cane fields; including parameters representative of sugar cane agricultural run-off
Reports on water quality are produced by RBAs	Number of water quality reports submitted to SEA	Reports to be made publicly available Analysis to interpret contribution of sugar cane farming should be made

Indicator	Measurement	Observations
Regulation of effluent discharges		
All sugar mills are in possession of an effluent control permit	Effluent Control Permits	
RBAs effectively take over functions to regulate effluent control permits	Effluent control permits given by RBAs	
Sugar mills carry out monitoring of effluents and report to the SEA in accordance to the Water Pollution Control Regulations	Effluent monitoring reports submitted to the SEA	
Regulation of atmospheric emissions		
Sugar mills carry out monitoring of atmospheric emissions and report to the SEA in accordance to the Atmospheric Pollution Control Regulations	Atmospheric emissions reports submitted to the SEA	
Other aspects		
Environmental and Social Code of Practice for the sugar sector developed	Code of Practice approved by stakeholders	This is an initiative that can be promoted by the government, but is of a voluntary nature and thus not linked to any established obligation. However, such a Code of Practice would be of great value as a framework for good practices.
Tonnes sugar produced under Fair Trade certification	Information from sugar cane producers and FLO	

7 RECOMMENDATIONS

NOTE: This StrEA seeks to enhance the environmental and socio-economic performance of the sugar sector in general, and the expected impacts derived from NAS implementation in particular. This requires actions at a strategic level.

The best way to enhance the environmental and socio-economic performance of the sector sometimes requires actions beyond those that can be addressed by the NAS, or even by institutions in the NAS Steering Committee.

Rather than limit recommendations to the narrow range of those actions that can be incorporated in the NAS document, this StrEA offers a wider range of options at a strategic level that would most effectively address the concerns in the sector.

However, this implies that the NAS Steering Committee – as a key body that seeks the overall improvement of the sugar sector – should engage in a policy dialogue with other relevant institutions (and the GoS in general) to facilitate the implementation of actions beyond its control.

7.1 Addressing High Priority aspects

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
A. WATER AVAILABILITY / CLIMATE CHANGE		
The National Climate Change Office, Swaziland Meteorological Service, National Water Authority, Department of Water Affairs, River Basin Authorities along with bulk water users, relevant government departments, sections and ministries and the scientific community responsible for climate change planning, must develop a strategy to adapt to the impact of climate change notably on water resources within the sugar sector, and be reflected in basin-wide water management. The Strategy: o Must establish the scale, significance and economic impact of climate change induced impacts on water resources through technical and scientific studies; o Relevant baseline information must be developed, collated and collected to inform the strategy; o Must identify the spatial and temporal impacts of climate change on irrigation water requirements and yields for sugar cane; o Must assess any beneficial effects of climate change on yield due to increased CO_2 concentrations that might offset the potentially negative impacts of increased irrigation needs; o Must identify realistic and achievable adaptation measures to be implemented by the sugar sector that may include improvements in irrigation water management practices (e.g. irrigation scheduling and improvements in irrigation efficiencies); o Must include a situational analysis of the institutional capacity of River Basin Authorities to implement their mandate as described in the Water Act, 2003; o Must be discussed and agreed with all key stakeholders; o Must include quantified objectives and time-bound targets; o Must define responsibilities; o Must include a mechanism to report implementation and achievement of targets and objectives, on a regular basis.	Led by the National Climate Office, Swaziland Meteorological Service, National Water Authority, Department of Water Affairs and River Basin Authorities. Also involvement of bulk water users, relevant government departments, sections and ministries and the scientific community responsible for climate change.	NB: This action needs to be addressed at a level higher than the NAS. The NAS SC and the EC should raise this issue with the SMS, DWA and RBAs to put it in their agenda. Funding can be sought from international bodies dealing with climate change, such as UNDP and the EC.

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
The National Water Authority, Department of Water Affairs, River Basin Authorities, bulk water users, and national authorities and the water management community responsible for water resource planning, must develop a strategy to address shortcomings in national water management and be reflected in a water management and use strategy to improve sector wide irrigation efficiencies and strengthen RBA capacity.. The Strategy: o Must address the shortfall in technical and financial capacity of RBAs to enable the RBAs to execute their mandated responsibilities; o Must be based on a basin-wide hydrological assessment of the water balance for the Komati, Mbuluzi, Usutu and Ngwavuma river basins; o Must propose measures to be taken up by irrigators to improve their overall water use efficiencies by moving from surface methods of irrigation to more efficient sprinkler, centre pivot and drip systems; o Must include recommendations on how to improve water governance at basin level; and o Must include a sugar sector water footprint assessment (direct and operational footprint).	Led by the National Water Authority, Department of Water Affairs and River Basin Authorities. Also involvement of relevant government departments, sections and ministries and the irrigation service business community.	The NAS SC and the EC should pursue this issue with the commercial sugar sector (cane growers, millers, SWADE and SSA), KOBWA, NWA, DWA and RBAs and engage in a policy dialogue to promote the implementation of the recommendations. Funding can be sought from international bodies dealing with water and transboundary management, such as GEF, World Bank, UNDP and the EC.
B. LONG-TERM SOCIAL AND ENVIRONMENTAL SUSTAINABILITY OF SMALL-CANE GROWERS		
To evaluate the management models for small cane growers currently promoted by developers (e.g. Millers and SWADE) and the SSA. An evaluation would comprise a SWOT analysis of current models, and comparing the models with other options (such as co-operatives). Particular consideration need be given to outsourcing the management of FAs, employing an outside private company to manage all the FAs in one development, such as in LUSIP and KDDP, and thus taking direct management responsibility away from the farmers themselves. The evaluation process would involve intense public participation at all levels, and particularly with the farmers themselves. It would require a supplementary education process, to ensure that the different options are presented before informed decisions are made.	RDMU, in collaboration with the SSA.	This recommendation falls directly in the scope of the NAS, and could be integrated in it. It could be funded by the EC. The information should be obtained through a public participation process at all levels, with assistance from the SCGA and project developers (e.g. SWADE) for accessing small cane growers.

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
To strengthen the capacity building and training of farmers, particularly in skills relating to managing farms, individually and as part of a FA. One body needs to be designated the task of managing training across-the-board, ensuring that the training offered is appropriate to the requirements of farmers, is of a high level, is standardised across the country, and is being implemented, reaching all those in need.	SHIP, in collaboration with the SSA.	This recommendation falls directly in the scope of the NAS, and could be integrated in it. It could be funded by the EC through SHIP. Information is to be gained from all organisations currently or potentially involved in training, including SEDCO.
In order to address concerns around a 'safety net', to ensure social safeguards against potential failure of sugar cane farming through allocating portions of land to alternative crops and livestock farming. This would have to be incorporated into the development plans of smallholder irrigation projects.	The SSA and the SCGA, to monitor implementation by SWADE.	This recommendation falls directly in the scope of the NAS, and could be integrated in it.
To undertake a cost-benefit analysis of the socio-economic impacts of increased mechanisation on the sugar industry, particularly on income and hence cash flow. Mechanisation will have both positive and negative effects; it may reduce labour requirements (thus indirectly related to HIV/AIDS) and labour costs, yet result in higher investment in equipment and energy costs, and cause the loss of jobs and potentially increase levels of poverty. Research into mechanisation would thus link in with broader socio-economic impacts.	RDMU, with assistance from the SSA.	This recommendation falls directly in the scope of the NAS, and could be integrated in it. It could be funded by the EC with possible financial support from SSA, and with input from the SSA, cane growers and Millers.
In order to reduce energy costs, an energy efficiency audit for the small cane growers should be undertaken to identify savings measures and equipment.	SSA with assistance from SWADE.	This recommendation falls directly in the scope of the NAS, and could be integrated in it.

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
C. LOSS OF BIODIVERSITY		
To develop a strategy to address the loss or degradation of biodiversity associated with an expanding sugar sector, the displacement of livestock and lack of compliance and monitoring for all sugar projects. The strategy: o Must address the requirement for biodiversity impact assessments and guidelines for such; o Must identify areas of high biological diversity and include the protection and management of such identified areas; o Must address the inadequate level of environmental compliance and monitoring of approved environmental assessment reports; o Must address the inadequate level of inclusion of livestock issues in pre- and post-development and develop clear guidelines on developing livestock impact assessment; o Must be discussed and agreed with all key stakeholders; o Must include quantified objectives and time-bound targets; o Must define responsibilities; o Must include a mechanism to report implementation and achievement of targets and objectives, on a regular basis.	Led by the SEA and the SNTC. Also involvement of relevant stakeholders, including the Veterinary Department with an integration of livestock extension (Animal Health and Production) of MOA.	NB: This action needs to be addressed at a level higher than the NAS. The NAS SC and the EC should raise this issue with the SEA and SNTC to put it on their agenda, so as to ensure its implementation when EIAs are carried out for sugar projects.

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
D. HIV/AIDS		
To undertake studies focusing on the impact of HIV/AIDS on the industry. This will include: o An analysis of the national policy, regulatory and institutional framework to address HIV/AIDS-related challenges in the sugar industry, and of what is being implemented on-the-ground; o An analysis to determine risk/trends as they relate to the sugar industry (utilising, e.g. statistical projections, Health Impact Assessments, research projects), including stakeholder response to the possibility of risk; and o An assessment of the effects of possible changes in the industry, such as reduction in smallholder projects, mechanisation, and introducing irrigation systems to reduce employment requirements and/or to alleviate the workload of those who are ill. In particular the latter should concentrate on a cost-benefit analysis of mechanisation as a mitigating factor to possible labour-related shortages, for the mills and cane growers.	RDMU and the Sugar estates with assistance from NERCHA.	This recommendation falls directly in the scope of the NAS, and could be integrated in it. Could be funded by the EC with possible financial support from Global Fund. Input from NERCHA, the MoH (particularly SNAP and local health centres), Millers, and project developers (e.g. SWADE). A report from RSSC on aspects of HIV/AIDS as it relates to the companies needs to be included, with permission from the RSSC. Research into mechanisation can be incorporated into the study undertaken for the long-term sustainability of small cane growers.
To invest in health services impacting on the sugar industry through allocating resources to the identification and management of HIV/AIDS, with emphasis on VCT to be able to assess the extent of the problem, and specifically in relation to small cane growers.	RDMU, as part of the MIP, with assistance from the MoH.	It could be funded by the EC, with possible financial support from Global Fund. The work can be coordinated with the provision of HIV/AIDS related health services by the Millers (RSSC and Ubombo Sugar), by SWADE as a developer of smallholder irrigation projects, and the services provided by the MoH in sugar irrigation areas and neighbouring communities.

7.2 Addressing Medium Priority aspects

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
E. EMISSION OF POPs		
To prepare a National Implementation Plan (NIP) for the Stockholm Convention which includes a strategy to reduce sugar cane burning. This strategy: o Must be discussed and agreed together with the key stakeholders, including as a minimum: sugar mill estates, cane growers and cane cutters o Must address the socio-economic aspects of increasing green cane harvesting, mainly reduced employment if mechanised, and fair standard for payment if hand-cut o Must include quantified objectives and time-bound targets o Must define responsibilities o Must include a mechanism to report implementation and achievement of targets and objectives, on a regular basis	Swaziland Environment Authority	NB: This action needs to be addressed at a level higher than the NAS. The SEA is already in the process of developing the NIP. The NAS SC and the EC should raise this issue with the SEA so it is adequately addressed.
F. WATER POLLUTION FROM AGRICULTURAL RUN-OFF / MONITORING OF WATER QUALITY		
A strategy must be in place to ensure the five RBAs are fully operational (with technical and financial capacity), including clear and time-bound targets (see Key Aspect 1 above on water availability/climate change).	Department of Water Affairs, River Basin Authorities	NB: This action needs to be addressed at a level higher than the NAS. The NAS SC and the EC should raise this issue with the DWA and the RBAs to put it in their agenda.

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
The **water quality monitoring system** must be reviewed and revised so that: o It is comprehensive. It covers the whole country. o It discriminates the different river basins and sub-basins, so those basins and sub-basins with especially poor water quality can be easily identified and monitored, and sources of pollution easier to identify. o It defines sampling points and methodologies in a strategic manner to monitor impacts from the main industrial, agricultural and domestic potential sources of pollution. In the case of sugar cane, sampling points must be placed before and after sugar cane farming areas, in order to be able to measure impacts from agricultural run-off. o Parameters to monitor are representative of likely pollutants. In the case of the sugar sector parameters must include: BOD, COD, suspended solids (SS), TDS, dissolved oxygen (DO), temperature, pH, conductivity, nitrates (NO_3^-), nitrites (NO_2^-), phosphates (PO_4^-), and fluoride. Basic parameters should be monitored regularly, whilst other parameters (e.g. herbicides, pesticides) can be monitored on a longer-time basis (e.g. annually or bi-annually), initially targeting those most commonly used.	Department of Water Affairs, River Basin Authorities	NB: This action needs to be addressed at a level higher than the NAS. The NAS SC and the EC should raise this issue with the DWA and the RBAs to put it in their agenda.
Water quality reports should be systematically produced by the RBAs and put in the public domain (e.g. SEA website).	Department of Water Affairs, River Basin Authorities	NB: This action needs to be addressed at a level higher than the NAS. The NAS SC and the EC should raise this issue with the DWA and the RBAs to put it in their agenda.
In case water quality monitoring identifies issues associated to agricultural run-off from sugar cane fields, an adequate **response strategy** should be generated to identify the causes and reduce contamination to ensure compliance with water quality objectives.	Department of Water Affairs, River Basin Authorities	NB: This action needs to be addressed at a level higher than the NAS. The NAS SC and the EC should raise this issue with the DWA and the RBAs to put it in their agenda.
The setting up of the RBAs should take into account the **costs associated to the monitoring of water quality** according to the above recommendations (e.g. number of samples, sampling points, costs of sampling and analysis, cost of reporting).	Department of Water Affairs, River Basin Authorities	NB: This action needs to be addressed at a level higher than the NAS. The NAS SC and the EC should raise this issue with the DWA and the RBAs to put it in their agenda.

7.3 Addressing Low Priority aspects

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
G. REGULATION OF EFFLUENT DISCHARGES		
Measures should be taken by the DWA, the RBAs and the sugar mills to ensure all three sugar mills are in possession of an **effluent control permit**, following a technical assessment of their effluent treatment facilities and practices.	DWA, RBAs, Millers	NB: This action partially needs to be addressed at a level higher than the NAS. The NAS could establish a deadline for the sugar Mills to be in possession of an effluent control permit. Also, the NAS SC and the EC should raise this issue with the DWA and the RBAs to put it in their agenda.
Measures should be taken by the SEA to ensure all three sugar mills submit their monthly and annual **effluent quality reports** according to the Water Pollution Control Regulations (2010) and in a manner and format approved by the SEA. Millers, from their part, must take the necessary steps to be in full compliance with the Effluent Control Regulations and carry out the necessary monitoring. The SEA should maintain that all effluents from the sugar mills, whether they are discharged directly to water-courses, or indirectly by being used for irrigation, are monitored according to the provisions of the Water Pollution Control Regulations (2010).	DWA, RBAs, Millers	NB: This action partially needs to be addressed at a level higher than the NAS. The NAS could establish a deadline for the sugar Mills to develop and implement effluent quality monitoring and reporting. Also, the NAS SC and the EC should raise this issue with the DWA and the RBAs to put it in their agenda.
If **effluent control regulations** under the Water Act (2003) are to be developed, it must be ensured that these are linked to the provisions of the Water Pollution Control Regulations (2010): o There should be no duplication of effluent standards, retaining those defined in the Water Pollution Control Regulations. o There should be no duplication in obligations for monitoring of effluent quality. A single set of parameters should be monitored and reported. o Compliance or non-compliance with effluent standards should be given under a single decision, jointly taken between the SEA and the authority in charge of implementing the effluent control regulations, as agreed. Appropriate coordination mechanisms should be set up to that effect.	DWA, RBAs, SEA	NB: This action needs to be addressed at a level higher than the NAS. The NAS SC and the EC should raise this issue with the DWA, the RBAs and the SEA to put it in their agenda.

H. REGULATION OF ATMOSPHERIC EMISSIONS		
The list of "controlled air pollutants" included in the Atmospheric Pollution Control Regulations (2010) (Schedule Two) should be amended to eliminate the ambiguous control parameter "any other potentially toxic compounds", which is unmanageable for regulatory purposes. Instead a provision should be put in place in the main text of the Regulations to the effect that the SEA may require other air pollutants to be monitored based on the nature of the operator's activities.	Ministry of Environment and Natural Resources; Swaziland Environment Authority	NB: This action needs to be addressed at a level higher than the NAS. The NAS SC and the EC should raise this issue with the MENR and the SEA to put it in their agenda.
The Swaziland Environment Authority should take measures to implement the Atmospheric Pollution Control Regulations (2010), including ensuring that sugar mills carry out the required monitoring. Millers, from their part, must take the necessary steps to be in full compliance with the Atmospheric Pollution Control Regulations and carry out the necessary monitoring. Based on the results of the monitoring of atmospheric emissions following implementation of the Air Pollution Control Regulations (2010), it can be determined if more efficient stack pollution control systems are required.	Swaziland Environment Authority Millers	NB: This action partially needs to be addressed at a level higher than the NAS. The NAS could establish a deadline for the sugar Mills to develop and implement air quality monitoring and reporting. Also, the NAS SC and the EC should raise this issue with the SEA to put it in its agenda.

7.4 Recommendations of a general nature

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
I. ADDRESSING RECOMMENDATIONS THAT FALL BEYOND THE SCOPE OF THE NAS		
All recommendations which fall beyond the immediate scope of the NAS (highlighted in yellow in the tables on recommendations) are nevertheless important to improve the environmental and socio-economic performance of the sugar sector in Swaziland. Attention must be explicitly drawn to the relevant institutions and bodies on the importance of actions from their part for the improvement of the sugar sector.	RDMU	RDMU to write dedicated communications to the concerned bodies (mainly NWA, DWA, SEA, RBAs, MNRE, MOA), informing of the outcome of the StrEA process, how the environmental and socio-economic performance of the sugar sector can be improved by actions from their institutions (spelling them out), and inviting them to a dialogue on their relevance and the way forward.

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
J. ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEMS		
The development of an **Environmental and Social Management Code of Practice** in the Sugar Sector should be promoted, to be prepared jointly by all key stakeholders. Implementation of the Code of Practice should be voluntary and in no way undermine the role of legislation or of the regulatory authorities. The Code of Practice should cover issues like environmental pollution, degradation and assessments.	RDMU NAS SC	This recommendation falls directly in the scope of the NAS, and could be integrated in it.
Efforts to achieve **Fair Trade** certification should be accelerated, as it provides a self-regulated system that helps achieve good environmental and social management practices in field operations.	RDMU NAS SC	This component is already integrated in the NAS, but merits more emphasis.
K. STRUCTURE OF THE NAS STEERING COMMITTEE		
The **NAS Steering Committee** should include representation from the Swaziland Environment Authority, the Swaziland National Trust Commission, the National Climate Change Office, the National Water Authority and representatives from the River Basin Authorities (e.g. Chairs of the RBAs). This is necessary to ensure the environment is better integrated in all NAS matters.	RDMU NAS SC	The NAS to invite suggested parties to discussion on how they can play a more constructive role in NAS implementation.
L. USE OF THE StrEA FINDINGS AND StrEA FOLLOW-UP		
Optimal use should be made of this Strategic Environmental Assessment process and report: o This StrEA should be distributed to all key stakeholders, taking the original list of invitees to the Stakeholders' Workshop as an indication of key stakeholders. o This StrEA report should be made publicly available and published on the web sites of at least the Restructuring and Diversification Management Unit (RDMU) and the European Commission (Swaziland Delegation). It is also recommended that it be made available on the web sites of the Swaziland Sugar Association (SSA) and the Swaziland Environment Authority (SEA). o The EC and RDMU should ensure that the findings of this StrEA are properly discussed in the NAS Steering Committee, and decisions/commitments made on how its findings will be implemented. Decisions and commitments should be recorded.	RDMU, EC NAS SC	NAS SC to distribute widely the StrEA via web based download links sent to all relevant parties.

RECOMMENDATION	INVOLVED INSTITUTION / ACTORS	IMPLEMENTATION ARRANGEMENTS
It is recommended to disseminate the findings of the StrEA through a **joint press release** (GoS – EC). This was done recently in Zambia, with an immediate reaction by journalists drawing further attention to the Study.	RDMU, EC	RDMU to prepare and publish a press statement on the StrEA and its core findings to broaden public awareness of the findings and challenges facing the sector.
It is recommended for the GoS and the EC to carry out a **review on the effectiveness of this StrEA process**; this could take place around 6 to 12 months after its completion. The review would respond to questions such as: (i) did the recommendations made in the StrEA get implemented? Why or why not?, and (ii) did the StrEA lead to better decisions from an environmental and socio-economic point of view? o The EC's environmental advisory services developed a framework for the evaluation of StrEA effectiveness (unofficial document), which could be used as a basis for the review assessment. There are other guidance documents available which could be used as reference (e.g. in the OECD DAC SEA Guidance57). o The results of the follow-up study should be used to draw lessons useful for the enhancement of the StrEA system in Swaziland, as well as for future StrEAs financed by the EC. Experiences could be shared in the region and internationally (e.g. at the IAIA – International Association for Impact Assessment – annual conference), also as a way to trigger discussions with experts in the area that could be useful for improvement. This would also raise visibility of GoS and EC efforts to effectively mainstream the environment in its policies, plans and programmes.	SSA, EC, SEA	Financing for this activity could be sought from the EC, as it is relevant also for evaluating effectiveness of EC-led StrEA processes

7.5 Performance indicators

Performance indicators related to the socio-economic and environmental aspects of the NAS are discussed in Section 6 above. These indicators should be incorporated in the NAS logical framework.

57 OECD DAC - Organisation for Economic Cooperation and Development, Development Assistance Committee (2006) *Applying Strategic Environmental Assessment, Good practice guidance for development cooperation,* OECD: Paris.

Annex 1: The NAS measures

NAS Area	Description	Proposed measures	Notes on possible associated actions
A. Competitiveness of the sugar industry			
A.1. Commercial cane growers	Commercial growers don't face major problems, but could increase their competitiveness	1. Intensify programmes for reducing field level costs, raise sucrose content, streamline cane delivery, reduce harvesting, haulage and loading costs, and reduce irrigation costs	Retrenchment of workers Management measures Increased use of fertilisers Financial measures Energy efficiency measures
A.2. Cane millers	There are opportunities to improve sucrose recovery in the mills and to reduce operating costs in the areas of personnel and energy	2. Explore the use of alternative forms of energy	Co-generation
	Expansion of cane growing areas will allow expanding milling capacity	3. Improve and expand the system of tarmac roads in the Lowveld	Roads upgrading Construction of bridges
A.3. Improved national infrastructure	Hauling and transport of cane are significant components of sugar cost	4. Improve Maputo freight handling facilities	
		5. Expand bagging capacity	
		6. Expand refining capacity	
		7. Reduce the cost of public utilities and improve their efficiency	
		8. Support research and development initiatives	
B. Trade policy and the pursuit of premium markets			
B.1. Domestic SACU market	There are opportunities to negotiate on the basis of the Trade, Development and Cooperation Agreement (TDCA) to secure advantages	9. Extend the provisions of TDCA to the entire SACU area and modify where necessary to include the development of regional demand for regionally produced sugar	
	Current arrangements within SACU offer opportunities	10. Maintain (and where possible expand) preferential access to regional markets and preserve the value of the domestic (SACU) market	

NAS Area	Description	Proposed measures	Notes on possible associated actions
B.2. Sugar sales in regional markets	Regional markets provide an opportunity to place Swazi sugar at markets marginally better than the world market. There are opportunities to get preferential access to regional markets.	11. Ensure a good transition arrangement is created to secure continued preferences on volume sales to the EU (particularly Sanitary and Phytosanitary – SPS - allocation) and seek increased access of Swazi sugar to the EU and other preferential markets	
B.3. The EU sugar market	The EU market will continue being a high premium market, and there are opportunities to maximise benefit from preferential access		
C. Promoting productivity and efficiency in smallholder cane growing			
C.1. Stabilisation of the financial situation of smallholder cane growers	Smallholders are at risk of not seeing personal benefits from upgrading measures due to their debts and high operational costs	12. Support smallholder farmers in improving their farm operations to improve efficiency and viability of existing farmers and facilitate the entry of new ones	Land use changes Financial support Irrigation infrastructure Training
C.2. Smallholder cane growing schemes at LUSIP and KDDP	Smallholders at KDDP face financial difficulties, and conditions for LUSIP smallholders should be carefully examined to minimise risks	13. Re-examine the viability of the smallholder cane grower component of LUSIP and KDDP	Financial audits Skills audits Management audits
C.3. Rationalisation of smallholder association management	There are problems of coordination between smallholder management and the mill requirements, which has led to decline of yields	14. Stabilise the financial situation of existing small and medium sized cane growers	
		15. Re-examine, with a view to improve, management training programmes presently provided to sugar farmer associations	Training needs assessments
		16. Improve cane production and harvesting, yields and sucrose content	Optimal use of fertilisers, agrochemicals and key inputs Expansion of viable cane farming

NAS Area	Description	Proposed measures	Notes on possible associated actions
		17. Provide capacity building programme to SWADE and SSA extension services	Capacity needs assessments Effective linkages between the institutions
		18. Introduce management (and productivity) conditions to smallholder cane crushing contracts	Management audits
		19. Design a financing/lending model for smallholder farming to be used by financial institutions	Clear separation of loan to long, medium and short term payments Competitive interest rates Timely access to finance
D. Diversification within and outside sugar industry			
D.1. Value-added products based on cane	There is a potential to expand co-generation with use of bagasse and sell power to the national grid	20. Expedite approval of legislation allowing the commercial sale of electric energy to the national power grid	Implementation of relevant sections of the Swaziland Electricity Company Act
D.2. Value-added products based on sugar	Ethanol does not seem at the moment to be viable as an alternative product to sugar, but developments and opportunities are to be monitored	21. Identify best practices to develop electric power co-generation within sugar industry based initiatives	Consultation with internationally reputable developments
D.3. Growing and marketing of crops other than sugar	There are opportunities to diversify into other agricultural products, but this requires careful consideration, especially in terms of markets and standards	22. Investigate alternate energy sources and products, including the efficiency of energy generation from biofuels	Consultation with internationally reputable experts
D.4. Strengthening agricultural research and extension	More research is required into the potential of alternative crops, to either complement or replace sugar	23. Support studies and programmes on the (viability of the) generation and use of bio-energy and production of ethanol	Implement the Biofuel Development Action Plan (MNRE)

NAS Area	Description	Proposed measures	Notes on possible associated actions
D.5. Trade in new products, food safety and standards control	Work is needed on meeting market requirements to allow Swaziland to export food products to international markets	24. Provide low-cost financing for pilot phases of co-generation of electric energy	Implementation of relevant sections of the Swaziland Electricity Act Explore international carbon market and trading opportunities
D.6. Diversification into new economic activities	The main economic activity to consider for diversification is tourism	25. Re-visit the industry agreement to ensure that growers get benefits from co-generation activities (on proceeds of bagasse)	Review the agreement
		26. Establish a facility/programme for farmers changing to other crops or to agricultural services	Explore alternative crops with effective institution and marketing arrangements
		27. Establish a scheme to enhance the capabilities of smallholder associations for quality control, packaging and marketing	
		28. Reduce transport costs and improve transport infrastructure and services from production centres and to link with markets	Building/upgrading of roads and bridges
		29. Develop financing model for diversifiers and help then in accessing finance and training	Explore effective institution and marketing arrangements
		30. Promote and support research and development into other products/crops	Identify sustainable funding sources for research Engage UNISWA and regional research bodies to explore alternative crops
		31. Establish and support institutions and infrastructure for testing of products for quality and standards	Work with the Swaziland Standards Authority Audit of existing facilities
		32. Develop products for existing and new markets and the necessary support mechanisms (infrastructure, marketing information, etc), including making the necessary investments (and policy changes) to make the production of alternative products viable	

NAS Area	Description	Proposed measures	Notes on possible associated actions
		33. Provide support for downstream value-added industries	
		34. Support the expansion of refinery capacity and efficiency	
		35. Develop tourism products for the SME sector in the sugar areas, and support new initiatives of diversification into sectors	Work with the Swaziland Tourism Authority on identifying sustainable tourism products
		36. Establish a support mechanism to follow-up recommendations on control of and compliance with food safety regulations	
E. Social services, welfare and labour issues			
E.1. Re-organisation of social and communal services at sugar estates	Plans are on the way to transfer all services currently provided by the sugar companies to the local authorities	37. Develop a model for the sustainable management and financing of social amenities in industry areas to ensure continued provision of quality housing, health, and education, currently financed by the industry	Review similar regional and international initiatives
E.2. Assistance to retrenched workers	Retrenchment programmes at the mills and major growers are taking place	38. Support the gradual development of local government structures capable of running social and communal services at the sugar communities	Capacity audits Review the Urban Government Act Review the land lease agreements Harmonise inconsistencies between SNL administration and TDL Consult traditional authorities (Chiefs)
		39. Create a programme to support transitional and coping measures for retrenched workers, especially with regards to access to industry social services	Implement relevant portions of the Poverty Reduction Strategy and Action Plan
		40. Support strengthening of basic social services provision to population, provide safety nets for retrenched and unemployed people	Training and capacity needs assessments

NAS Area	Description	Proposed measures	Notes on possible associated actions
		41. Implement multi-skilling programmes for workers retrenched at sugar companies	Work closely with relevant partners such as existing FAs, SEDCO, etc.
		42. Establish an effective and continuous AIDS programme, and related AIDS (effects) mitigation measures	
F. Mitigating impact on government fiscal position			
F.1. Mitigating impact on government fiscal position	Swaziland will lose about €9 million per annum in revenues from the sugar levy. Budget support is necessary but the country does not qualify, so measures will be needed to enable it to quality	No specific actions are foreseen	
G. Enhancing a sustainable socio-economic environment and cross-cutting issues			
G.1. General investment climate	An implementation of the investor roadmap which show areas where Swaziland needs to work on in order to improve its attractiveness for foreign investment is required	43. Establish effective support services for rural micro- and small-scale enterprises, as farms and mills lay off personnel outsourcing services	Consult the Ministry of Enterprise and Employment Implement relevant portions of the Poverty Reduction Strategy and Action Plan
G.2. Natural environment	There are environmental concerns about the level of air pollution caused by the use of coal as a supplementary fuel in the sugar factories	44. Relax regulations governing establishment of new businesses	Consult the Ministry of Enterprise and Employment
	There is a need to develop a national water conservation and management system, as well as a national water master plan	45. Support the implementation of the investor roadmap	Consult the Ministry of Enterprise and Employment Consult with the Swaziland Investment Promotion Authority

NAS Area	Description	Proposed measures	Notes on possible associated actions
	Support to industrial-scale trials of substituting coal by baled sugar cane trash as supplementary factory fuel should be provided	46. Establish a research farm to run practical field scale agronomic research and market research on alternative crops to sugar cane	Work with the Ministry of Agriculture Work with UNISWA Faculty of Agriculture Work with agricultural development NGOs
	In general terms there is need to improve environmental management mechanisms	47. Improve security of tenure on land	Consult Ministry of Agriculture and relevant traditional leadership structures
G.3. Improve access and security of tenure on land	Access to land is very regulated and limited, not easy to use as means to support income generation, nor use SNL as collateral for loans	48. Ensure full concessional/grant financing of LUSIP	Consult Ministry of Agriculture and relevant traditional leaders
G.4. Providing grant financing of LUSIP	The sugar reforms have put LUSIP at risk, and financing is required to ensure its viability	49. Support semi-industrial-scale trials of substituting coal by baled sugar cane trash as supplementary industrial fuel	
G.5. Empowerment of the poor to generate income	MEPD has developed a framework for providing access to credit for business and agricultural purposes through the Poverty Fund, but many eligible poor are unaware of it or don't know how to access it	50. Expand and improve quality of the national schooling and technical training	Consult with the Ministry of Education
G.6. Human capital development	Important issues of health and education to tackle, due to various factors, and which will required considerable Government support	51. Decentralise planning, budgeting and delivery of services to the rural poor	Consult with the Ministry of Finance and the Ministry of Tikhundla Administration and Development
G.7. Pursuit of good governance	Need to promote decentralised planning, budgeting, delivery of services to rural poor, and improving management of the country's tax authorities	52. Engage the EU with a view to move the assistance modality towards sectoral and/or general budget support	Consult Ministry of Economic Planning and Development
		53. Promote good governance	

NAS Area	Description	Proposed measures	Notes on possible associated actions
		54. Train communities on the utilisation of Poverty Funds to support coping and diversification, including entry into sugar industry	Implement relevant portions of the Poverty Reduction Strategy and Action Plan
		55. Support the development of a national water conservation plan	Implement the relevant portions of the Water Act and the Integrated Water Resources Master Plan
		56. Improve environmental management mechanisms	Work with the Swaziland Environment Authority
H. Institutional structures for implementation			
H.1. Institutional structures for implementation	Implementation of the NAS requires dedicated institutional structures	57. Establish “Restructuring and Diversification” Unit	
		58. Support the continuous operation of the National Adaptation Steering Committee	
		59. Evaluate the capacity of existing institutions and programmes in delivering of the activities required in the adaptation strategy	
		60. Support the creation of additional structures/institutions/programmes necessary for the successful implementation of the strategy	

Annex 2. Leopold-type matrices

Figure 28: Environmental and socio-economic impacts of the sugar industry in general

SUGAR INDUSTRY	Water balance	Cont. groundwater	Cont. surface water	Soil salinisation	Soil erosion	Soil compaction	Other soil charact.	Ambient air quality	GHG emissions	Protected areas	Deforestation	Biodiversity	Terrestrial flora + fauna	Wetland systems	Landscape	HIV/AIDS	Malaria	Respiratory disease	Other health factors	Food security	Energy efficiency	Social conflict	Employment	Social services	Rural infrastructure	Gender
Field operations																										
Land preparation																										
Planting																										
Manual harvesting																										
Cane burning																										
Mechanised harvesting																										
Use of organic fertilisers																										
Use of inorganic fertilisers																										
Use of other agrochemicals																										
Surface water abstraction																										
Irrigation – Furrow																										
Irrigation – Centre-pivot																										
Irrigation – Drip																										
Transport of cane																										
Sugar factories																										
Disposal of effluent																										
Filter cake disposal																										
Disposal of molasses																										
Boiler and fly ash disposal																										
Boiler emissions																										
Burning of bagasse/ trash																										
Burning of carbon																										
Co-generation																										

(-) low significance; (-) medium significance; (-) high significance; (+) low significance; (+) medium significance; (+) high significance

Figure 29: Environmental and socio-economic impacts associated to NAS actions

NAS ACTIONS	Water balance	Cont. of groundwater	Cont. of surface water	Soil salinisation	Soil erosion	Soil compaction	Other soil characteristics	Ambient air quality	GHG emissions	Protected areas	Deforestation	Biodiversity	Terrestrial flora + fauna	Wetland systems	Landscape	HIV/AIDS	Malaria	Respiratory disease	Other human health factors	Food security	Energy efficiency	Social conflict	Employment	Social services	Rural infrastructure	Gender
Competitiveness																										
1. Programmes for raising sucrose content; streamline cane delivery; reduce costs: field level, harvesting, haulage, loading, irrigation																										
2. Explore use of alternative forms of energy																										
3. Improve and expand system of tarmac roads in the Lowveld																										
4. Improve Maputo freight handling facilities																										
5. Expand bagging capacity																										
6. Expand refining capacity																										
7. Reduce cost of public utilities and improve their efficiency																										
8. Support research and development initiatives																										
Trade policy dimension and active pursuit of premium markets																										
9. Extend TDCA provisions to all SACU area; modify/develop regional demand for regionally produced sugar																										
10. Maintain (where possible expand) preferential access to regional markets; preserve value of SACU market																										
11. Ensure good transition arrangement to secure continued preferences on vol sales to EU, seek increased access of SZ sugar to EU and other preferential markets																										

NAS ACTIONS	Water balance	Cont. of groundwater	Cont. of surface water	Soil salinisation	Soil erosion	Soil compaction	Other soil characteristics	Ambient air quality	GHG emissions	Protected areas	Deforestation	Biodiversity	Terrestrial flora + fauna	Wetland systems	Landscape	HIV/AIDS	Malaria	Respiratory disease	Other human health factors	Food security	Energy efficiency	Social conflict	Employment	Social services	Rural infrastructure	Gender
Promoting small holder sugar cane growing																										
12. Support smallholder farmers improve farm operations to improve efficiency and viability of existing - and facilitate entry of new – farmers																										
13. Re-examine viability of LUSIP + KDDP smallholder cane grower component																										
14. Stabilise financial situation of existing small and medium sized cane growers																										
15. Re-examine, with view to improve, management training programmes presently provided to sugar FAs																										
16. Improve cane production and harvesting, yields and sucrose content																										
17. Provide capacity building programme to SWADE and SSA extension services																										
18. Introduce management (and productivity) conditions to smallholder cane crushing contracts																										
19. Design a financing/lending model for smallholder farming to be used by financial institutions																										
Diversification																										
20. Expedite approval of legislation allowing the commercial sale of electric energy to national power grid																										
21. Identify best practices to develop electric power co-generation within sugar-industry-based initiatives																										

NAS ACTIONS	Water balance	Cont. of groundwater	Cont. of surface water	Soil salinisation	Soil erosion	Soil compaction	Other soil characteristics	Ambient air quality	GHG emissions	Protected areas	Deforestation	Biodiversity	Terrestrial flora + fauna	Wetland systems	Landscape	HIV/AIDS	Malaria	Respiratory disease	Other human health factors	Food security	Energy efficiency	Social conflict	Employment	Social services	Rural infrastructure	Gender
22. Investigate alternate energy sources and products, incl. efficiency of energy generation from biofuels																										
23. Support studies and programmes on (viability of) generation and use of bio-energy and production of ethanol																										
24. Provide low-cost financing for pilot phases of co-generation of electric energy																										
25. Re-visit industry agreement to ensure growers benefit from co-generation (on proceeds of bagasse)																										
26. Establish a facility/programme for farmers changing to other crops or to agricultural services																										
27. Establish a scheme to enhance capabilities of smallholder associations for quality control, packaging, and marketing																										
28. Reduce transport costs and improve transport infrastructure and services from production centres and to link with markets																										
29. Develop financing model for diversifiers and help them in accessing finance and training																										
30. Promote and support research and development into other products/crops																										
31. Establish and support institutions and infrastructure for testing of products for quality and standards																										

NAS ACTIONS	Water balance	Cont. of groundwater	Cont. of surface water	Soil salinisation	Soil erosion	Soil compaction	Other soil characteristics	Ambient air quality	GHG emissions	Protected areas	Deforestation	Biodiversity	Terrestrial flora + fauna	Wetland systems	Landscape	HIV/AIDS	Malaria	Respiratory disease	Other human health factors	Food security	Energy efficiency	Social conflict	Employment	Social services	Rural infrastructure	Gender
32. Develop products for existing and new markets and necessary support mechanisms, including making the necessary investments (and policy changes) to make production of alternative products viable																										
33. Provide support for downstream value-added industries																										
34. Support the expansion of refinery capacity and efficiency																										
35. Develop tourism products for the SME sector in the sugar areas, and to support new initiatives of diversification into sector																										
36. Establish support mechanism to follow-up recommendations on control of and compliance w/ food safety regulations																										
Social amenities provision																										
37. Develop model for sust. management and financing of social amenities in industry areas to ensure continued provision of quality housing, health, and education, currently financed by industry																										
38. Support gradual development of local government structures capable of running social and communal services at the sugar communities																										
39. Create programme to support transitional and coping measures for retrenched workers, especially in regard to access to industry social services																										

NAS ACTIONS	Water balance	Cont. of groundwater	Cont. of surface water	Soil salinisation	Soil erosion	Soil compaction	Other soil characteristics	Ambient air quality	GHG emissions	Protected areas	Deforestation	Biodiversity	Terrestrial flora + fauna	Wetland systems	Landscape	HIV/AIDS	Malaria	Respiratory disease	Other human health factors	Food security	Energy efficiency	Social conflict	Employment	Social services	Rural infrastructure	Gender
40. Support strengthening of basic social services provision to population; provide safety nets for retrenched and unemployed people																										
41. Implement multi-skilling programmes for workers retrenched at sugar companies																										
42. Establish an effective and continuous AIDS programme, and related AIDS (effects) mitigation measures																										
Enhancing a sustainable socio-economic environment																										
43.Establish effective support services for rural micro- and small-scale enterprises, as farms and mills lay off personnel outsourcing services																										
44. Relax regulations governing establishment of new businesses																										
45. Support the implementation of the investor roadmap																										
46. Est. research farm to run practical field scale agronomic and market research on alternative crops to sugar cane																										
47. Improve security of tenure on land																										
48. Ensure full concessional/grant financing of LUSIP																										
49. Support semi-industrial-scale trials of substituting coal by baled sugar cane trash as supplementary industrial fuel																										
50. Expand and improve quality of national schooling and technical training																										
51. Decentralise planning, budgeting and delivery of services to rural poor																										

NAS ACTIONS	Water balance	Cont. of groundwater	Cont. of surface water	Soil salinisation	Soil erosion	Soil compaction	Other soil characteristics	Ambient air quality	GHG emissions	Protected areas	Deforestation	Biodiversity	Terrestrial flora + fauna	Wetland systems	Landscape	HIV/AIDS	Malaria	Respiratory disease	Other human health factors	Food security	Energy efficiency	Social conflict	Employment	Social services	Rural infrastructure	Gender
52. Engage the EU with a view to move the assistance modality towards sectoral and/or general budget support																										
53. Promote good governance																										
54. Train communities on the use of Poverty Funds to support coping and diversification, incl. entry to sugar industry																										
55. Support the development of a national water conservation plan																										
56. Improve environmental management mechanisms																										
Institutional structures for implementation and coordination																										
57. Establish RDMU																										
58. Support the continuous operation of the National Adaptation Steering Committee																										
59. Evaluate the capacity of existing institutions and programmes in delivering activities required in adaptation strategy																										
60. Support creation of additional structures/institutions/programmes for the successful implementation of the strategy																										

Negative impact, low significance; Negative impact, medium significance; Negative impact, high significance; Positive impact, low significance; Positive impact, medium significance; Positive impact, high significance

Annex 3: Key stakeholders

Table 19: Main institutional actors relevant to the NAS

Institutional Actor	Description / relevance to the NAS
Ministry of Economic Planning and Development (MEPD)	The mission of the MEPD is to "promote sound macro-economic management that will provide an enabling environment for sustainable economic growth and efficient and cost-effective delivery of services". The MEPD acts as Chair to the NAS Steering Committee, and is the key contact point for the EU.
Ministry of Tourism and Environmental Affairs (MTEA)	The mission of the Ministry is to "ensure sustainable and equitable development of our environment and tourism for a better life for all through: creating conditions for sustainable tourism growth and development for the benefit of all Swazi citizens, promoting the conservation and sustainable utilisation of our national resources to enhance socio-economic benefits, protecting and improving the quality and safety of the environment, promoting a global and sustainable development agenda, and promulgation of sound policies and legislation". Especially relevant to the StrEA of the NAS are two parastatals: the Swaziland Environment Authority (SEA) and the Swaziland National Trust Commission (SNTC). The Ministry itself is a stakeholder due to their responsibilities at a policy level on environmental matters.
Ministry of Health (MoH)	The health sector "seeks to improve the health and social welfare status of the people of Swaziland by providing preventive, promotive, curative and rehabilitative services that are relevant, accessible, affordable, equitable and socially acceptable". Of particular importance are the following services: Directorate of Health Services, for public health and curative services. National Public Health programmes include: immunisation, health education, rural health, nutrition (through the National Nutrition Council – NNC), AIDS (through the Swaziland National AIDS Programme – SNAP), non-communicable diseases, sexual reproduction, malaria, tuberculosis and bilharzia control, disability, and emergency preparedness and response. Department of Pharmaceutical Services, which includes a Substance Abuse Prevention Programme. The National Advisory Committee on Substance Abuse (NACSA) helps co-ordinate all activities that are involved in the control, use and abuse of psycho-active substances. Environmental Health Department, responsible for "formulating, adopting, promulgating, regulating, interpreting, coordinating, supervising and monitoring the implementation of policies, strategies and activities related to environmental health". The overall objective of the Department is to ensure a safe environment and sustainable development; more specifically it aims to reduce morbidity and mortality resulting from environment-related conditions/diseases. Environmental Health programmes are designed to prevent/control diseases and illnesses through specific interventions in the areas of: water supply and sanitation; personal hygiene and health; occupational hygiene; environmental and occupational health epidemiology; food safety; environmental protection (e.g. environmental health impact assessments); healthy housing; control of communicable diseases (e.g. water-borne diseases such as malaria, bilharzia and cholera, and food-borne diseases); and emergency preparedness and response.

Institutional Actor	Description / relevance to the NAS
	The areas of service delivery are the access points to health care, and the mode by which the MoHSW provides services to the population. Health facilities that exist in the country include: hospitals (7), health centres (12), clinics (162), public health units (8) and 187 outreach sites. Relevance to NAS: Issues include: (1) provision of health services to support the sugar industry; (2) health impact of smallholder (cane) irrigation schemes and other sugar sector developments e.g. HIV/AIDS and other sexually transmitted diseases, water-borne diseases; (3) impact of HIV/AIDS on the performance/effectiveness of the sugar sector; (4) alleviation from poverty and food insecurity e.g. social welfare programmes and substance abuse prevention, with particular emphasis on vulnerable groups; and (5) environmental health e.g. occupational health at the workplace.
Ministry of Labour and Social Security	The Ministry is concerned specifically with labour-related issues, and the application and enforcement of applicable laws. The Ministry also provides general supervision of a Provident Fund – a voluntary fund for employed workers (excluding casual workers) that provides old age benefits, permanent disability benefits, and benefits to survivors. For Injury on Duty, there is an employer-liability system, involving compulsory insurance with a private carrier – for employed persons in the private and public sectors, trainees, and apprentices, excluding casual workers and certain types of contract workers. Department of Social Welfare, whose objectives are: to protect and safeguard human welfare, with special emphasis on vulnerable groups (e.g. children, the elderly, people with disabilities, women) and other groups in need of care and special protection; to provide social work services to restore and promote the adequate social functioning of individuals, groups and communities; to facilitate the development and implementation of nationally approved social welfare programmes; to empower individuals, groups and communities to be self-reliant; to provide assistance in cash/kind to people of limited means and to victims of disasters (natural or not); and to provide therapeutic and rehabilitative services to restore and promote the social functioning of individuals and groups. The Social Welfare Department administers the social assistance programme, and Old-Age Grant paid quarterly.
Ministry of Agriculture (MOA)	The mandate of the Ministry of Agriculture is to transform Swaziland's agricultural production system from its prevailing subsistence mode to more commercially oriented production systems through commercialisation and the diversification of small and medium (S&M) holder SNL and Title Deed Land (TDL) agricultural production. The role of the Department of Agriculture and Extension is to effectively and efficiently disseminate appropriate technologies and workable extension messages that will promote household food security and increase agriculture productivity through the diversification and commercialisation of agricultural activities, while ensuring community participation and sustainable development of the country's natural resources. The Land Use Planning Section is mandated to plan and monitor the utilization of land and water resources nationwide, particularly on Swazi Nation Land (SNL). The Department of Veterinary Services is responsible for Animal Health Services, Livestock Development and Marketing Services as well as Meat Hygiene Services.

Institutional Actor	Description / relevance to the NAS
Ministry of Natural Resources and Energy (MNRE)	The MNRE is responsible for the development, use and management of the country's natural resources (water, minerals, energy and land) in a sustainable manner, with minimal damage to the environment. More specifically its objectives include: to provide and maintain facilities for ensuring availability of adequate energy and water; to implement policy to ensure optimal land use; to provide surveys, mapping and valuation of related services for the government; to locate, identify and provide proper management of minerals and groundwater resources; and to promote Swaziland's national interests in natural resources internationally. The Ministry's portfolios include: ▪ Energy, Power Generation and Management ▪ Water Resources Development ▪ Land Resources, Acquisition and Allocation; Land Consolidation; Land Valuation; Land Surveys (Cadastral); Land Control Board ▪ Farm Dwellers Act The Energy Department administers the energy sector through: ▪ The Conventional Fuels Unit deals with issues relating to sources of energy that are non-renewable, including electricity. The general functions of this Unit are to co-ordinate and supervise SEB, improve accessibility to electricity, implement the Energy Policy, and develop a national electrification programme. The Unit is also tasked with the planning of rural electrification, and chairs the Select Committee on Rural Electrification (SCORE), a committee representing stakeholders with interests in rural development. ▪ The Renewable Energy Unit deals with New and Renewable Sources of Energy (NRSE), such as energy harnessed from biomass and biogas. It co-ordinates and advises the Renewable Energy Association of Swaziland (REASWA). The unit is conducting a feasibility study on farming for energy, to determine the land/crops suitable for the production of biodiesel, and to investigate the required investment to produce biodiesel for the Swaziland market (including export). The Unit is responsible for gender issues in the energy sector. ▪ The Rural Electrification Unit is responsible for projects undertaken in rural electrification that target schools, health care facilities and other government institutions as a priority. ▪ The Swaziland Electricity Company (SEC) is tasked with providing a reliable power supply to the nation. The Department of Water Affairs has: ▪ a Water Resources Branch ▪ Dam Operations and Maintenance, whose function includes the proper release of water to satisfy downstream users and the ecological environment; ▪ a Hydrology Section, whose function includes to collect, process and analyse river flow data to enable the implementation of water resources projects, and to guide water resources management strategies; and

Institutional Actor	Description / relevance to the NAS
	▪ Water Control Unit, whose mandate includes water quality and quantity, Activities of this section include control of the quantity of water abstracted for use by irrigated agriculture; to be technical advisor, secretary and executive officer to the Water Apportionment Board; and to not only control water pollution, but specifically the quality of effluent resulting from the use of water by industry. Specifically the section is responsible for monitoring the water quality in the country's rivers so as to advise the department and interested stakeholders on the water quality situation. A Laboratory Section carries out effluent and water analysis tests, and water quality sampling. ▪ Rural Water Supply Branch, to provide clean safe drinking water supplies to residents in the rural areas.
National Water Authority (NWA)	The National Water Authority (NWA) was formed in April 2003 in accordance the Water Act (No. 7 of 2003). The Authority advises the minister responsible for water affairs and it also provides direction on water issues such as policy development and other related issues in the land. The NWA will consist of up-to fifteen members, appointed by the MNRE. Four are senior officials from the MNRE; MEPD; MOA, and MoHSW. Three are appointed by the Minister nominated by each of the following: SSA; Swaziland Citrus Board (SCB); and Swaziland Chamber of Commerce and Industry (SCCI). The Minister appoints three members who represent Associations, Co-operatives and individuals on Swazi Nation Land (SNL). There are five nominated representatives for each of the five River Basin Authorities (RBAs) (yet to be established) who sit on NWA. The functions of the NWA include, *inter alia*, to: ▪ prepare, and update, the Water Resources Master Plan; ▪ advise the Minister on the promulgation of regulations with respect to the setting of fees or charges for covering operation, cost and maintenance of government works, application fees, fees for appeals or charges for use of water; ▪ oversee the work of and provide policy criteria and direction to the Board and Project Boards, River Basin Authorities (RBAs), and task forces and to approve their budgets before they are submitted to the Minister; ▪ advise the Minister on policy directions relating to water affairs; ▪ co-ordinate the work of different boards, water sector agencies and international water commissions; ▪ recommend policy with respect to the issue, renewal, amendment or cancellation of permits; ▪ monitor and recommend policy direction and guidelines to the Swaziland member of the Tripartite Permanent Technical Committee (TPTC) and the Joint Water Commission (JWC) and any other international water commission; ▪ review and consider recommendations from the TPTC, JWC and any other international water commission and make recommendations thereon to the Minister; determine the proper management of works and ensure that periodic safety inspections are made of all works ▪ consider, approve, amend or reject water development proposals.

Institutional Actor	Description / relevance to the NAS
	▪ recommend to the Minister the adoption of water quality objectives; ▪ recommend to the Minister time limits for renewal of permits; ▪ cause to be maintained, expanded and continued, the collection of hydrological, meteorological or other water related data and to arrange for the collecting and making available to the Authority, to the Board and to the public of all such data as may be obtained.
Swaziland Sugar Association (SSA)	An umbrella organisation equally owned by the cane growers and the millers of sugar cane. Its mandate is to promote the efficient production as well as the optimal marketing of the country's sugar. Sugar cane growing is only allowed through a quota issued by the Sugar Industry Quota Board. Marketing of all sugar produced in Swaziland is through the SSA; the proceeds from the sales are distributed based on an agreed sharing structure; the SSA makes payment to the three millers, who in turn are responsible for onward distribution to the growers. SSA also provides technical services to assist the industry raise operational efficiency, especially at field level. This includes assisting smallholder cane growers working on SNL through training, extension services and irrigation advice (this function the SSA is sourcing from the mills through the Out-grower Departments). In 2001 SSA received certification under the ISO 9001:2000, a quality management system designed to place operations at a systematic, consistent level.
Swaziland Water and Agriculture Development Enterprise (SWADE)	Swaziland Water and Agricultural Development Enterprise (SWADE) is a company wholly owned by Government; it is controlled and monitored as a Public Enterprise, in terms of the Public Enterprise (Control & Monitoring Act, 1989). It operates under a Board of Directors, which is responsible for the overall policy direction. SWADE falls under the Ministry of Agriculture. SWADE is mandated by Government "to facilitate the planning and implementation of the Komati Downstream Development Project and the Lower Usuthu Smallholder Irrigation Project, and any other large water projects that Government may assign from time to time." SWADE plays the role of facilitator rather than manager of projects; this ensures that the affected communities control their development. SWADE is composed of a multi-disciplinary team of advisors and trainers who enable beneficial national development and community integrity in the Project Development Areas. SWADE has two broad national objectives that it seeks to fulfil, namely; 1. Promoting participation of smallholder farmer organizations in irrigated agriculture and development of other enterprises as part of poverty eradication programme for rural areas; and 2. Enhancing private sector development through the active participation of small and medium enterprises (SMEs) in agricultural development.

Institutional Actor	Description / relevance to the NAS
Komati Basin Water Authority (KOBWA)	A bi-national company of GoS and the Republic of South Africa (RSA), KOBWA was established through the Treaty on the Development and Utilisation of the Water Resources of the Komati River Basin (1992) to implement Phase 1 of the Komati River Basin Development Project. The project includes the construction of Maguga Dam on the Komati River, opened in March 2003. The main objectives of the Maguga Dam Project include to: stabilise flow in the Komati River downstream of the Dam, allow for a 'moderate' increase in irrigation development, and improve the assurance of water supply to existing and expansions in irrigation development in the Komati River Basin. KOBWA is involved in water management, and develops operating rules for the management of the Komati River System, which includes: drought management plans, water resources availability assessments, and rules for water resource utilisation. It develops monitoring systems for water availability and usage, and the quality of aquatic ecosystems. KOBWA deals with environmental and social issues associated with the implementation of the project, ensuring that "the quality of the existing environment is maintained or improved", and that the resettlement of affected homesteads by the project "are left 'better off' than they were prior to project implementation"[58]. Of the latter, those resettled downstream of the Dam have been assisted in a livelihood restoration programme which includes an agricultural irrigation scheme, including the production of sugar cane. Relevance to NAS: Issues include assurance of sufficient and regular/stabilised water downstream of Maguga Dam in the Komati River Basin, to enable the development of irrigation schemes, particularly for the sugar sector.
Swaziland Environment Authority (SEA)	Set up by the Swaziland Environment Authority Act (1992), the SEA is an executive body dealing with all the environmental matters in the country. In relation to the Strategic Environmental Assessment, the SEA is most relevant insofar as it has a remit on: (a) monitoring the state of the environment; (b) advising on environmental policies; (c) controlling pollution from the sugar sector, especially water and atmospheric emissions; (d) ensuring development projects do not interfere with the quality of the environment; and (e) review and approve projects from an environmental stand point. Recently, and under the Water Act, the competence for the regulation of effluent discharges now falls on the responsibility of the River Basin Authorities (RBAs).

58 Pamphlet: *Komati Basin Water Authority (KOBWA).*

Institutional Actor	Description / relevance to the NAS
Department of Water Affairs (DWA), Ministry of Natural Resources and Energy	One of the key institutions established under the Water Act 7 of 2003 is Department of Water Affairs (DWA), and is under the MNRE. Responsibilities of the DWA include, *inter alia*, to: ▪ provide technical support and advice to the NWA; ▪ arrange for provision of technical advice and co-operation from and with other Ministries; ▪ monitor surface, ground-water and water releases from and to international borders as per international law and any agreements between Swaziland and its neighbouring states; ▪ monitor surface and groundwater quality to control water pollution; ▪ ensure that projects that are dependent on water resources are fully supported through the provision of adequate water supplies; ▪ seek international agreements that ensure an equitable water apportionment with neighbouring states, in compliance with international law; ▪ periodically review Swaziland's surface and groundwater balances; in the light of developments that have taken place in Swaziland and upstream; ▪ implement the national Water Resources Master Plan (WRMP) (a National Water Resources Strategy) and other water strategies water policies as approved by the NWA; ▪ develop and implement drought and flood management strategies; and ▪ co-ordinate water management for equitable allocation, utilisation and sustainability of water resources by River Basin Authorities, other government departments and non-governmental organisations.
Roads Department, Ministry of Public Works and Transport	The Department's Mission is to "provide, maintain and improve a safe reliable and environmental sustainable road network that will stimulate socio-economic development, job creation and reduced road user costs". To do this it studies, analyses, design, upgrades, constructs and maintains the National Road Network. The Roads Department is relevant to the NAS insofar as its infrastructure component is concerned.
National Emergency Response Council on HIV and AIDS (NERCHA)	An organisational body established by government in December 2001 as a Committee under the Prime Minister's Office, NERCHA became a Council by Act of Parliament No. 8 2003. NERCHA Council reports directly to the Prime Minister[59]. Its mandate is to co-ordinate and facilitate the national response to HIV/AIDS, and to oversee the implementation of the National Multisectoral Strategic Plan (NSP) for HIV and AIDS and develop the National Multisectoral Strategic Framework (NMSF) for HIV and AIDS 2009-2014. In addition, a comprehensive National Monitoring and Evaluation (M+E) System has been developed.

59 Pamphlet: *What is NERCHA: A Nation at War with HIV/AIDS*; and The Kingdom of Swaziland. *The National Multisectorial Framework for HIV and AIDS: 2009-2014*.

Institutional Actor	Description / relevance to the NAS
	The NSP has 8 sub-thematic areas, for which NERCHA plays a co-ordination role: institutional arrangements, community mobilization, planning and programme development, advocacy and communication, the mainstreaming of cross-cutting issues (human rights, gender, poverty, socio-cultural practices, and disability), M+E, HIV and AIDS research, and resource mobilisation and management. The core principles that guide NERCHA in coordinating and managing its national response are: national and equitable coverage of services, using local solutions and existing structures, community-driven interventions, sustainability of interventions, and mainstreaming of HIV and AIDS, as a core component of business and work. Relevance to NAS: Issues include: impact of smallholder (sugar) irrigation schemes and other sugar sector developments on the increase of HIV/AIDS and other sexually transmitted diseases and impact of HIV/AIDS on the performance/effectiveness of the sugar sector.
Energy Department, Ministry of Natural Resources and Energy	The Mission of the Energy Department is to "effectively manage the national energy resources and to work towards affordable and sustainable energy provision for all the people of the country, whilst ensuring the international competitiveness of the energy sector". Its functions cover, amongst others, the improvement and administration of legislation in the sector, analysis of energy policy, technical studies research and projects, and providing energy security through energy trade and diversity of supply services. The Energy Department is relevant to the NAS in regards to: co-generation with sugar cane biomass; Independent Power Producers; energy security for cane growers; sustainable energy policy.
Swaziland Electricity Company (SEC)	Parastatal with responsibilities for the supply of electricity. Its Mission Statement includes the need to supply the electricity in an environmentally sound manner. The Swaziland Electricity Company is relevant to the NAS especially with regards to energy requirements and costs to small growers, as electricity is, together with transport, one of the most important factors that could make a difference between viable or non-viable farming.
Swaziland National Trust Commission (SNTC)	The Swaziland National Trust Commission (SNTC) is a body corporate established by the SNTC Act of 1972. The Act provides for the operation of cultural institutions and the proclamation and management of national parks, monuments and related matters. The Act grants the SNTC powers to proclaim national parks and monuments. It can acquire or alienate movable and immovable property subject to this Act with the approval of the Deputy Prime Minister. Any doubts or clarification of this Act require the Minister to obtain the decision of the Ngwenyama in writing which decision shall be final and binding to all concerned.
Swaziland Meteorological Services (SMS)	The Department of Meteorology is the National Meteorological Authority for Swaziland, which operates under the Meteorology Act 1992. The SMS is Swaziland's Focal Point for the United Nations Framework Convention on Climate Change, and heads the Swaziland Climate Change Programme.

Table 20: Other key stakeholders relevant to the NAS

Stakeholder	Description / relevance to the NAS
Swaziland Cane Growers Association (SCGA)	The local sugar industry derives its structure from the Sugar Act of 1967. The SCGA is a professional body that represents cane growers. It is one of the main bodies represented in the SSAs Council, together with the Swaziland Sugar Millers Association.
Swaziland Sugar Millers Association (SSMA)	Professional body that represents cane millers. It is one of the main bodies represented in the SSAs Council, together with the Swaziland Cane Growers Association.
Royal Swaziland Sugar Corporation (RSSC)	Sugar company that owns two sugar mills and estates, one in Simunye and one in Mhlume. In its Simunye installations it also has a distillery. It has an estate in Simunye and another in Mhlume, receives cane from cane growers in the vicinity, including from the KDDP scheme, but also from the Malkerns area. Its milling capacities had to expand to accommodate cane from the KDDP developments. In the 2008/09 season it produced 183,843 tonnes of sugar in its Mhlume mill and 233,557 tonnes of sugar in its Simunye mill. The distillery produced 25,853 million litres of ethanol in 2009. Currently RSSC provides and manages housing and related infrastructure for its employees and their dependants and apart from direct employees, a further 25,000 people live on the estates. The group provides education for 2,500 children at two private primary schools, supported by a further three high and four primary schools. The group is also a founder and stakeholder in Mananga College, a private high school. The RSSC provides subsidised health care at two clinics run by qualified doctors and nurses, It has a safety, health and environmental policy aiming for ideal working conditions, safeguarding those affected by the operations of RSSC and ensuring the maintenance of a clean and healthy environment. HIV/AIDS is recognised as a strategic business issue and is managed through an HIV/AIDS Tripartite Committee in which management, the workers union and the staff association are represented. A coordinator facilitates all programmes and related issues. Two voluntary counselling and testing (VCT) centres at Mhlume and Simunye were established jointly with NERCHA in 2003. Free anti-retroviral treatment became available for employees in 2004 through NERCHA from the Global Fund. An ongoing campaign encourages employees to test for HIV for early diagnosis, prevention, care and support.
Ubombo Sugar	Sugar mill and estate located in Big Bend. It is owned by the South African company Illovo and Tibiyo TakaNgwane. It has an estate, and receives cane from cane growers in the vicinity, including from the LUSIP schemes. Its milling capacities are to expand to accommodate cane from the LUSIP developments. In the 2008/2009 season it produced 209,584 tonnes of sugar. Ubombo's employment conditions include medical care for employees and their dependents. It implements an HIV/AIDS policy and a comprehensive system of primary health care. The company owns and manages a 40-bed hospital to serve employees and the Big Bend community. Quality safety, health and environment obligations are observed, and both the milling and agricultural divisions are accredited to ISO 9001:2000 and NOSA. The company supports a primary school and two high schools that are run by Swaziland Educational Project, with subvention from the company. There is an employee home ownership scheme, and a township has been declared in the area where some of the company houses will be sold with priority given to employees.

Stakeholder	Description / relevance to the NAS
USA Distillers	One of two existing ethanol distilleries in Swaziland. It is related to the sugar sector as its main raw material is molasses, a by-product of the sugar process. The main environmental hazard of the distillery process is the management of vinasse.
Commercial farmers	A number of large commercial farmers supply cane to the mills, mainly Tisuka TakaNgwane, Tibiyo, Crookes Plantations, Nisela Farms; Umbuluzi Estates; and Tambankulu.
Farmers Associations	Numerous Farmers Associations have been established to support the sugar sector, for projects such as the Lower Usuthu Smallholder Irrigation Project (LUSIP) and the Komati Downstream Development Project (KDDP).
Lower Usuthu Smallholder Irrigation Project (LUSIP)	Lower Usuthu Smallholders Irrigation Project. LUSIP is an irrigation project to allow smallholder farmers to expand their productivity, mainly (but not exclusively) through the production of sugar cane. It is expected to benefit approximately 3,300 farm households, which corresponds to about 30,000 people. LUSIP is being designed in such a way that the Usuthu River's peak summer flows will be diverted into a 160 Mm^3 capacity off-river reservoir. Water will then be conveyed to some 11,500 ha of irrigable land, which is being developed in two phases.
Komati Downstream Development Project (KDDP)	The Komati Basin Development project was conceived in the early 1980's to provide irrigation water for farm development in South Africa and Swaziland. It consisted of three parts: (1) construction of the Maguga Dam; (2) development of 7,400 ha of irrigated farms downstream; and (3) expansion of the Mhlume sugar mill. KDDP is the second component of the Komati Basin Development project. The main crop being developed is sugar cane. The project was conceived with four development pillars: ▪ Setting up of smallholder farmer associations; ▪ Design and implementation of measures to mitigate the environmental and social impacts of the scheme; ▪ Development of irrigated smallholder farms on approximately 7,400 ha of land along the Komati River; and ▪ Monitoring of the measures designated to mitigate the environmental and social impacts of the scheme. The project commenced in July 1999. To date about 3,700 ha of production land have been planted to sugar cane and 350 ha have been dedicated to diversified agricultural production. A total of 239 homestead garden businesses have been established.
Restructuring and Diversification Management Unit (RDMU)	Established in 2007 to assist the MEPD co-ordinate the implementation of the National Adaptation Strategy (NAS). The RDMU currently manages the implementation of the EU Multi-Annual Indicative Programme (MIP) 2007 – 10 through the NAS Steering Committee.
Small-Holder Irrigation Project (SHIP)	Established under the RDMU as part of the EU support to the NAS. SHIP provides support to new smallholder schemes with regards to their irrigation projects. It has mainly been active in the LUSIP area. SHIP also has responsibilities for capacity building (both new and existing growers).

Stakeholder	Description / relevance to the NAS
River Basin Authorities (RBA)	River Basin Authorities (RBAs) are foreseen under the Water Act (2003). Five RBAs have been established to implement a management plan under the Water Resources Management Plan. The composition of a RBA will be established by regulation. Powers, duties and functions of RBAs include: ▪ to keep a data base of basin information, including water availability and water demand data, and to monitor and keep record of changes in water conditions in the basin; ▪ to issue, amend and renew or suspend water permits; ▪ to impose water restrictions on all water users in times of water shortage; ▪ to investigate the need for water resources development and management and to advise the Authority on the need to appoint Project Boards; ▪ to investigate the need for inter-basin transfers, to negotiate it with other basin authorities, and to advise the Authority in respect thereof; ▪ to arbitrate user disputes; ▪ to monitor and control water quality and enforce effluent regulations; ▪ subject to the approval of the Authority, to levy and collect rates and charge to defray part or all costs of the RBA; ▪ have authority over Irrigation Districts, Project Boards and User Associations.
Irrigation Districts	Irrigation Districts are foreseen under the Water Act (2003). These may be established by the Minister (MNRE) upon recommendation of the National Water Authority. An Irrigation District is a Body Corporate; it exercises control over the operation and maintenance of works in the district and the distribution of permitted volumes of water in accordance with permits and for the benefit of persons in the district and such other functions as may be set out in the notice of incorporation.
Water Users Associations	Permit holders relating to land and undertakings in a defined area, or of permits relating to water in a defined watercourse of river system or portions of it may form Water Users Associations with the objective of maximising benefits from such permits to members of the association and promoting the more efficient use of permitted water. Water Users Associations are provided for under Article 77 of the Water Act (2003).
Coordinating Assembly of Non Government Organisations (CANGO)	CANGO was founded in 1983, in response to an appeal by the then Ministry of Health for "better coordination of primary heal care activities in pursuit of the universal goal of health for all by the year 2000"[60]. Since then there has been a shift to encompassing all NGOs working in the area of development, with CANGO playing the role of a national umbrella body for the NGOs. The organisation takes a pro-poor stance, with the objectives of: ▪ providing a forum that facilitates capacity building and dialogue to identify issues affecting the marginalised; ▪ facilitating a coordinated NGO development programme; ▪ serving as a resource for receiving, processing and sharing information to benefit stakeholders;

60 *Insight on CANGO* pamphlet, produced by the organisation.

Stakeholder	Description / relevance to the NAS
	▪ engaging, advocating and lobbying decision-makers around concerns of the disadvantaged; ▪ fostering strategic partnerships. CANGO coordinates HIV/AIDS, Food Security, Gender and Children consortia of NGOs. The key programmes of relevance to NAS include: ▪ HIV and AIDS Coordination Project, in response to the pandemic; ▪ Strengthening Leadership and Organisational Development, with an aspect on gender mainstreaming and gender budgeting; ▪ Economic Justice Project, building the capacity of civil society to engage the budget process, resulting in increased resource allocations in the social sector.
Yonge Nawe	Main environmental NGO in Swaziland established in 1987 to address environment and conservation issues in Swaziland. It is currently implementing three complementary programmes: Environmental and socio-economic justice. The focus of this programme is on policy, law, compliance and enforcement. It acts on issues that affect socially disadvantaged members of society and threaten environment and sustainable development. The programme aims to achieve equity and social justice in Swaziland through the empowerment of socio-economic disadvantaged members of society. Natural Resources Management This programme focuses on sustainable management of natural resources, issues of environment and development, human health and waste management. Areas of work within the programme include environment and health (HIV/AIDS, occupational health and safety, waste management) and water resources (water as a basic human requirement for survival, public interest water use, quality, access and equity and the integrity of ecosystems). Information, Education and Communications This programme informs, educates and communicates issues on the state of the environment and impact on sustainable development. Yonge Nawe offers a proactive information and knowledge service that is both informing and empowering target stakeholders to take action that contributes to environment and sustainable development in Swaziland.
United Nations Development Programme (UNDP)	UNDP works on the basis of the Standard Basic Framework Agreement signed between UNDP and the GoS (dating from 1977). National development priorities are regularly identified and reflected in a five year United Nation Development Framework (UNDF). The current UNDF for Swaziland (2006-2010) addresses three programme priorities: Poverty Eradication; HIV/AIDS; and Good Governance and Gender Mainstreaming as well as Basic Social Services.
Malkerns Irrigation Development Company (MIDC)	Organisation that provides the management for the Malkerns Canal, used mainly for the irrigation of sugar cane in the Malkerns area, which is supplied to the Simunye mill (RSSC).

Stakeholder	Description / relevance to the NAS
World Vision	World Vision is an international Christian organisation whose mission is primarily transformational development, community-based and sustainable, focusing on the needs of children[61]. The organisation uses an Area Development Programme (ADP) approach, seeking to facilitate the well-being of children, empowering them with life skills, and at the same time ensuring that households and communities are interdependent and resilient. Interventions range from economic development, food and livelihood security, health and nutrition, HIV prevention, education, and infrastructure development. The organisation has prioritised economic development, to ensure that communities, and especially women, are able to save, borrow against their savings, and initiate income-generating activities. ADPs have also assisted rural communities with access to potable water, through facilitating the provision of boreholes and community taps, and with food security, through providing farmers with seeds and tools. The HIV/AIDS unit conducts training for HIV teams for church associations at regional level; constructs houses for Orphans and Vulnerable Children (OVC) with assistance from communities; facilitates educational support for children in difficult circumstances, provides treatment to vulnerable children; purchases medicine for chronically ill people; and trains target groups on child protection and response mechanisms to HIV/AIDS. The Humanitarian and Emergency Affairs section was strengthened to improve the situation of people affected by the drought in the country, and the impact of HIV/AIDS. The objective was to increase household resilience for children, their families, and the communities in which they live, particularly in response to disaster threats. Through food distribution agreements with the World Food Programme (WFP) and other bodies, WorldVision provides food assistance for targeted beneficiaries, including OVC, people living with HIV/AIDS, the aged and women-headed households.
World Food Programme	In response to the high level of food insecurity, poverty and HIV/AIDS within the country the WFP, a UN body, is undertaking a number of activities: ▪ targeted food distribution to food-insecure households that are finding difficulty in supporting themselves e.g. those headed by women, the elderly, and orphans; ▪ support to households affected by HIV/AIDS e.g. medical supplies and food supplements; ▪ food-for-assets programme, with people working on projects (e.g. road and dam construction, dam protection from animal watering, and reclamation of eroded land) and in return receive assistance in food security (e.g. training in crop diversification); ▪ food support to primary schools, and to OVCs. In fulfilling its task, the WFP works with other organisations, such as WorldVision, Africa Cooperative Action Trust (ACAT), Save The Children, Lutheran Development Services (LDS), AMICAALL, and the Swaziland Farmers and Development Foundation (SFDF)

61 World Vision. *Swaziland Annual Report 2007*. www.worldvision.org

Stakeholder	Description / relevance to the NAS
Other NGOs	Other NGOs are active in Swaziland, especially dealing on issues of poverty reduction, food security, HIV/AIDS and gender. Some of these include: ▪ CARITAS ▪ Save the Children ▪ AMICAALL ▪ Africa Cooperative Action Trust (ACAT) ▪ Lutheran Development Services ▪ Women & Law in Southern Africa

Annex 4: Main policy documents and legislation relevant to the NAS

Table 21: Main policies plans and programmes relevant to the NAS

Policy, Plan or Programme	Description / relevance to the NAS
National Environmental Policy (draft)	Draft policy whose main goal is "to promote the enhancement, protection and conservation of the environment and the attainment of sustainable development in Swaziland". The Policy promotes a series of policy instrument, including education and communication, legislation (including establishing environmental standards and rules, creation of rights and incentives, strengthening EIA procedures and promoting environmental assessment of policies plans and programmes), economic instruments and public sector investment. The Environmental Policy is central to analyse environmental implications of the NAS, and to help shape response and mitigation measures that conform to it. However, its draft status since 1998 does not confer it too much weight in policy terms.
Swaziland Environment Action Plan (SEAP)	Policy document that provides the framework to manage Swaziland's environment. It was defined prior to the National Environmental Policy and foresees actions (some already implemented or overridden by new policy documents) under the following headings: socio-economic development and the environment; human settlements, pollution and health; international treaties, conventions and agreements; legal framework for environmental management; institutional framework for environmental management; and environmental education, public awareness and participation.
Swaziland National Biodiversity Strategy and Action Plan (draft) (2001)	The 2001 draft National Biodiversity Strategy and Action Plan (BSAP) has as principal objectives (1) to conserve the biodiversity of Swaziland, (2) to encourage the sustainable use of biodiversity, and (3) to ensure that the benefits accrued from the use of biodiversity are shared equitably. The BSAP establishes six goals and makes recommendations towards their achievement: (1) to conserve a viable set of representative samples of natural ecosystems; (2) to sustainably use the biological resources of natural ecosystems outside protected areas; (3) to conserve the genetic base of Swaziland's crop and livestock breeds; (4) to minimise risks associated with the use of modified organisms; (5) to establish effective institutional, policy and legal frameworks; and (6) to enhance public awareness and support for biodiversity conservation. The sustainable utilisation of biological resources is compromised through expanding land clearing for sugar cane and the unintended consequences of contamination of water sources by agricultural runoff. The continued expansion of smallholder irrigation projects and sugar cane estates, particularly where these displace natural vegetation is a clear threat to the country's biological resources.
Biodiversity Conservation and Management Policy (draft) (2007)	Draft policy developed under the Swaziland Biodiversity Conservation and Participatory Development (BCPD) Project. The need of this policy is justified by (1) the need for regulatory measures to address the status of biodiversity in Swaziland, and (2) to fulfil the UNCBD obligations. The draft policy addresses four pillars: (1) conservation of biodiversity; (2) sustainable use of biodiversity; (3) access and benefit sharing; and (4) capacity to manage biodiversity.

Policy, Plan or Programme	Description / relevance to the NAS
National Water Policy (draft) (2009)	The draft Water Policy outlines the main policy strategies to optimise the sustainable utilisation of the country's limited water resources. An important element of the policy is improvement of water availability for both socio-economic and economic productivity. The policy also provides clear demarcation of the responsibilities of the various stakeholders and institutions involved in the integrated development and management of water resources in the country. Through the Water Act River Basin Authorities have been established (December 2009) and water management responsibilities have been handed down to each basin. The overall goal of the NWP is sustainable development and management of water resources in the country through integrated planning. The implementation of the NAS measures must be guided by the principles enshrined in this policy. Water, in terms of the Constitution, is a national resource and as such must be put to work where it can play an important social and economic function but at the same time the utilisation of the resource must be contained within a longer-term sustainable framework to ensure its continued availability for future generations and must not cause the degradation of vital ecosystem services.
Integrated Water Resources Master Plan (draft)	Integrated planning is being enshrined through the formulation of an Integrated Water Resources Master Plan. The IWRM Plan, still in draft, seeks to combine essential IWRM principles and procedures (namely stakeholder consultation, capacity building, training and research in water development and management) as well as integrating sustainability issues. The IWRM Plan seeks to "promote the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems". Thus IWRM builds on three basic pillars: (1) an enabling environment of proper water resources policies and legislation; (2) an institutional framework of capable institutions at national, local and river basin levels, and (3) a set of management instruments for these institutions by developing a strategy for financing IWRM implementation and also reviewing. The implementation of the NAS measures where these concern irrigation and water abstraction must ensure that the resource is utilised in a sustainable manner and where possible based on sound science and research on the quantity and quality of the resource and its safe abstraction rate.
The National Forest Policy (2002)	Policy that aims to achieve sustainable forest management and sustainable development of all types of forests in Swaziland. Its development was triggered in part due to the extent of deforestation in the country due to various activities and the need of a coordinated response and adequate institutions. Relevance to the NAS rests mainly on its section on natural forests and woodlands, which may be affected by the expansion of sugar cane farming.
The National Forestry Programme (draft) (2002)	The main purpose of the National Forestry Programme is to identify the priority problems, the corresponding plans for action and the projected timing of starting and duration. Relevance to the NAS mainly relates to the actions foreseen to protect natural forests and woodlands, as land use changes (into sugar cane farming) may affect biological diversity and valuable forest resources that may not have the desired degree of protection.

Policy, Plan or Programme	Description / relevance to the NAS
National Report on Climate Change (First National Communication to the UNFCCC)	First report from the GoS to the UNFCCC secretariat in compliance with the Convention. It contains, apart from a general overview of the country, an inventory of greenhouse gases, an analysis on the country's vulnerability to climate change and foreseen adaptation measures, an indication of mitigation measures (reduction of GHG emission) and a review of relevant policies and measures.
National Food Security Policy for Swaziland (2005)	Widespread poverty and food insecurity are a major concern for the government; the Policy thus looks at the means of attaining food security and reducing poverty. The Policy was drafted under the guidance of the Food Security Task Team, established under the Consultative Committee on Food Security, a cross-sectoral committee with representatives from government, NGOs, the private sector and other stakeholders – the Ministry of Agriculture (MOA), the United Nations Development Programme (UNDP), the FAO (Food and Agriculture Organisation of the United Nations), NERCHA, and the Swaziland Farmers and Development Foundation (SFDF).
Poverty Reduction Strategy and Action Plan (PRSAP)	The revised 2005 draft PRSAP presents a poverty reduction framework which consists of six pillars: (1) rapid acceleration of economic growth based on broad participation; (2) empowering the poor to generate income and reduce inequalities; (3) fair distribution of the benefits of growth through public expenditure; (4) ensuring food security; (5) improving the quality of life of the poor; and (6) strengthening good governance. The most essential parts of the PRSAP are consolidated under the empowerment of the poor to generate income through: i) improving access to land, ii) increasing income from agriculture, and iii) reducing unemployment. As poverty is more prevalent in rural areas, smallholder irrigation development is regarded as vital to its alleviation. The strategies proposed under human capital development focus on education, health, food security and nutrition, and safe water and sanitation. Implementation of the PRSAP seen as crucial in achieving the goals of the National Development Strategy (NDS).
Strategy Brief for National Food Security and Agriculture Development Horizon 2015 (2005)	Prepared by the FAO and the MOA, the Brief represents an initial step in the process of developing a national food and agricultural strategy to enable the country to fulfil its obligations to the WFS commitments and FAO support to it – for support to longer term processes to upgrade food and agriculture policies in line with the NDS. The Brief looks at priority areas and actions/strategies from 2006-2015, in particular to achieve the Millennium Development Goals (MDGs). These include: the expansion of areas under sustainable land management and reliable water control systems; the improvement of rural infrastructure and trade-related capacities for improved market access, enhancement of food supply, and reduction of hunger; the development of agricultural research, technological dissemination and adoption, to sustain long-term productivity growth; and the integration of livestock, fisheries, forestry and the environment in agricultural development.

Policy, Plan or Programme	Description / relevance to the NAS
Poverty Reduction Strategy and Action Plan (PRSAP)	The revised 2005 draft PRSAP presents a poverty reduction framework which consists of six pillars: (1) rapid acceleration of economic growth based on broad participation; (2) empowering the poor to generate income and reduce inequalities; (3) fair distribution of the benefits of growth through public expenditure; (4) ensuring food security; (5) improving the quality of life of the poor; and (6) strengthening good governance. The most essential parts of the PRSAP are consolidated under the empowerment of the poor to generate income through: i) improving access to land, ii) increasing income from agriculture, and iii) reducing unemployment. As poverty is more prevalent in rural areas, smallholder irrigation development is regarded as vital to its alleviation. The strategies proposed under human capital development focus on education, health, food security and nutrition, and safe water and sanitation. Implementation of the PRSAP seen as crucial in achieving the goals of the National Development Strategy (NDS).
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Policy, Plan or Programme	Description / relevance to the NAS
Comprehensive Agricultural Sector Policy (CASP) (2005)	The Comprehensive Agricultural Sector Policy (CASP) is a tool that will be used to propel the sustainable development of the sector in order to enhance poverty reduction and food security at both household and national level. All aspects of production, consumption and marketing are addressed in this document. The CASP goal and objectives have been formulated in accordance with the national aspirations as stated in the Vision 2022 and the NDS. The goal of CASP is, therefore, to ensure that the agriculture sector contributes fully to the socio-economic development of the country. The broad objective is to provide clear guidance on policy options and measures necessary to enhance sustainable agriculture sector development and its contribution to overall economic growth, poverty alleviation, food security and sustainable natural resources management. Specific objectives are set to be pursued by CASP: ▪ to increase agricultural output and productivity. ▪ to increase the earnings for those engaged in agriculture by promoting adoption of diversification and sustainable intensification and use of appropriate technology. ▪ to enhance food security. ▪ to ensure sustainable use and management of land and water resources. ▪ to stabilize agricultural markets. Policy pillars are: ▪ Policies on rain-fed crop sub-sector ▪ Policies on irrigated crop sub-sector, covering: water management; water allocation, productivity and efficiency; water quality; improving participation of smallholders in irrigation schemes; development of irrigation infrastructure; operation, maintenance and cost recovery of irrigation facilities; commercial sugar cane production; smallholder cane growing; options to diversify irrigated crop production. ▪ Policies on livestock sub-sector ▪ Policies on research, extension, marketing and credit ▪ Policies on food security

Policy, Plan or Programme	Description / relevance to the NAS
Comprehensive Africa Agriculture Development Programme (CAADP)	The Comprehensive Africa Agriculture Development Programme (CAADP) of the New Partnership for Africa's Development (NEPAD) provides a framework for restoring agricultural growth, rural development and food security in the African region. The CAADP seeks to revitalize the agricultural sector through special policies and strategies targeted at small scale and traditional farmers in rural areas and the creation of enabling conditions for private sector participation, with emphasis on human capacity development and the removal of constraints to agricultural production and marketing, including loss of soil fertility, poor water management, inadequate infrastructure, and pests and diseases. The Swaziland CAADP is divided into five pillars of activities: (1) expansion of area under sustainable land management and reliable water control systems; (2) improvement of rural infrastructure and trade–related capacities for improved market access; (3) enhancement of food supply and reduction of hunger (including emphasis on emergencies and disasters that require food and agricultural responses); (4) development of agricultural research, technological dissemination and adoption to sustain long–term productivity growth; and (5) livestock, fisheries and forestry. In March 2010 Swaziland officially signed up to the CAADP principles and will develop interventions designed around the five pillars. Through the implementation of the NAS, elements of CAADP activities are already included and with additional resources, NAS measures around research, food supply and improvement of rural infrastructure could be enhanced.
National Irrigation Policy (draft) (2005)	The overall goal of the 2005 draft National Irrigation Policy is to ensure that the irrigated agriculture sub-sector in Swaziland contributes fully to economic growth and poverty alleviation in accordance with national development goals, the Water Act of 2003 and the need to use the country's limited natural resources in a sustainable fashion. There are three specific objectives: (1) to optimize the productivity of water in the country's agricultural sector and broaden the scope for agricultural intensification and diversification; (2) to establish an irrigation sector institutional landscape characterised by transparent regulation and strong, participatory and/or responsive and accountable institutions in Swaziland; (3) to enhance the structure of the irrigated sub-sector by promoting new public and private investment opportunities for emerging farmers. Through the implementation of the NAS measures, particularly those relating to improved irrigation infrastructure, the core policy objectives are being met.
National Energy Policy (2002)	The Energy Policy was developed to address the challenges of the transformation of the energy sector and the overall development of the country. Its key objectives are: (a) ensuring access to energy for all; (b) enhancing employment creation; (c) ensuring security of energy supply; (d) stimulating economic growth and development; and (e) ensuring environmental and health sustainability. This policy is relevant to the NAS in two main ways: (1) the cost of energy is a major concern to secure the viability of smallholder cane farmers; and (2) the NAS promotes increasing co-generation at the sugar mills and the selling of surplus energy to the national power grid.

Policy, Plan or Programme	Description / relevance to the NAS
National Energy Policy Implementation Strategy (draft)	The National Energy Policy Implementation Strategy is aimed at providing clearly identified targets and actions for the existing Energy Policy. The strategy identifies the relevant stakeholders who are expected to lead the implementation and approximate costs of the individual projects. In addition, the Strategy identifies a number of priority projects and provides detailed proposals to enable the GoS to identify funding requirements. The Vision of the National Energy Policy was formulated as follows: "ensuring that the development goals of the country are met through the sustainable supply and use of energy for the benefit of all the citizens of the country". Irrigated agriculture plays a critical role in the economy of the country as a food provider and a major contributor to exports. It is a major electricity consumer but has the potential to contribute significantly in the production of electricity through cogeneration projects which are being actively studied. The NEPIS is presented in eight separate strategies, which have been developed to be utilised as standalone documents for the relevant sectors or interested parties. These strategies include: ▪ Electricity and Power Generation ▪ Renewable Energy and Climate Change ▪ Energy Savings and Energy Efficiency ▪ Petroleum ▪ Biomass and Household Energy ▪ Biofuels ▪ Energy and Poverty ▪ Institutional The implementation of the NAS measure on cogeneration will strengthen the availability of electricity in the country. Energy is seen as a key component with regard to power generation from bagasse and ethanol production.
National Biofuels Development Strategy and Action Plan (2009)	The biofuels development strategy outlined potential development routes biofuel production, processing and use could take. The strategy was informed by a detailed feasibility study that identified critical areas including crop selection. The Action Plan was finalised in 2009 and promotes the blending of petrol with bioethanol produce from molasses. In addition to increase participation of rural farmers, a programme of research and development of sweet sorghum is proposed. The relevance to the NAS is the country's commitment to blend petrol with ethanol produced locally from sugar by-products thus creating a market for the ethanol.

Policy, Plan or Programme	Description / relevance to the NAS
The Rural Resettlement Policy (2002)	The National Rural Resettlement Policy (NRRP) is the most authoritative national policy guideline on resettlement even though it has its base in resettlement in rural areas to promote improved agricultural productivity. The NRRP is not limited to resettlement *sensu stricto*, but also sets out a wide ranging policy framework with respect to the improvement and planning of land use. The guiding vision of the NRRP is: To establish a durable, practical and participatory framework for the planning and sustainable management of land, and the appropriate application of resettlement strategies in rural Swaziland, in order to increase agricultural production, promote the sustainable utilisation of natural resources and improve livelihoods. Whether resettlement involves "re-arranging" land-uses within a community, or "moving" communities from one place to another to allow for needed development activities, rural resettlement is never an end it itself - it is a tool for achieving certain objectives, such as the betterment of livelihoods, the improvement of land uses and national economic growth. It is a fundamental premise of the Policy that the role and potential of resettlement in modern times can only be meaningfully understood within the overall context of rural governance and land management. The vision of the Policy, therefore, looks beyond resettlement narrowly defined, towards the more profound task of defining an overall framework for sustainable land management in rural Swaziland. As such, it focuses on: ▪ the goal of *improving land use* in rural Swaziland in order to enhance sustainable livelihoods; ▪ the *correction of existing land-use problems* through participatory planning by all stakeholders, including the relocation of sub-optimal land uses where it is economically and physically feasible, socially acceptable and urgent to do so; ▪ the prevention *of future land-use problems* through universal introduction of better land planning tools and compliance mechanisms in rural areas to ensure that land use is done wisely and that plans will be respected; and ▪ ensuring that affected people are at least as well-off after resettlement as they were before.
The National Multisectorial Strategic Framework for HIV and AIDS (2009 – 2014)	The National Multisectorial Strategic Framework (NMSF), developed by NERCHA, describes a five year (2009-2014) National Multisectoral Framework for HIV and AIDS for the country, informed by the National Multisectoral HIV and AIDS Policy (2006), and by lessons learnt through developing and implementing the second National Multisectoral HIV and AIDS Strategic Plan (NSP II 2006-2008). Its aim is to bring together stakeholders to scale up and mainstream decentralised and effective response strategies to HIV and AIDS.
Decentralisation Policy (2005)	The goal of the Policy is to provide an enabling environment for promoting and enhancing sustainable and participatory local and national economic, political and social development within a decentralised governance framework.

Policy, Plan or Programme	Description / relevance to the NAS
Draft National Land Policy (NLP) (1999)	The Draft Policy was prepared with a view to improving access to land and security of tenure on Swazi National Land (SNL), including tenure on irrigation schemes, and clarifying roles and responsibilities for land administration. The possibility of leasehold arrangements and transferable user rights for individual farmers and farmer groups on SNL are considered, proposing that the 99-year leasehold concept, already being applied on SNL by the Ministry of Housing and Urban Development (MoHUD) in an urban context, be applied to rural SNL. The Draft also proposes changes to systems of land allocation to allow women to have equal access. Further development of the NLP was temporarily suspended pending the finalisation of the Constitution. There have been recent developments in finalising the draft but no public
National Physical Development Plan (NPDP) (1996-2006)	The Plan specifies where development should happen. Its main purpose is to spatially interpret national economic planning and implementation currently driving all major developments in the country, and to strengthen inter-sectoral coordination of the overall development within a spatial framework, ensuring balanced use of land and natural resources. Plan proposals have been formulated for six sectors: the physical environment, rural land use and agriculture, non-agricultural productive sectors, human sector hierarchy, infrastructure, and community facilities. In 2004 the GoS initiated the preparation of Regional Physical Development Plans (RPDP), to integrate the planning of urban centres and rural districts.
National Transport Policy	The transport policy is oriented to establish a transport system that provides a safe, efficient, cost-effective and fully integrated infrastructure and operations to best meet the needs of customers, promotes economic and social development, and is environmentally and economically sustainable. The Policy refocuses the GoS's primary role to policy and strategy formulation and regulation, with reduced direct involvement in operations and provision of infrastructure services. The principle of user charging will be used either from direct or indirect sources. However, the GoS is aware of its responsibilities to provide socially necessary infrastructure in rural areas and ensure improved mobility and accessibility. The road sub-sector policy and strategy is on strengthening the institutional capacity of the Ministry of Public Works and Transport, reforming the institutional environment, and establishing new financing mechanisms for road development. The Transport Policy is of relevance to the NAS with regards to its transport component.

Table 22: Main regulations relevant to the NAS

Piece of legislation	Description / relevance to the NAS
Swaziland Environment Authority Act No 15 (1992)	Act that establishes the Swaziland Environment Authority (SEA) and its functions. The Environmental Management Act (2002), however, turned the SEA into a body corporate.
The Environment Management Act No 5 of 2002	The purpose of the Act is to provide for and promote the enhancement, protection and conservation of the environment and where appropriate, the sustainable management of natural resources. The Act sets out the framework for environmental management, including integrated environmental management; pollution control; waste management; international matters; public participation; and compliance and enforcement. It is central to assess the environmental implications of the NAS, as well as to provide a framework for the definition of mitigation and response measures which conform to it. For example, in terms of considering the implications of climate change, the Act establishes the precautionary principle, which could underpin actions to address significant impacts even in absence of absolute scientific certainty.
The Environment Audit, Assessment and Review Regulations (2000)	These Regulations address the environmental control of foreseen and existing activities, mainly through Environmental Impact Assessment, environmental audits and Environmental Compliance Certificates.
The Water Act (2003)	The Water Act of 2003 is the law governing the use and management of water resources. It seeks to integrate and decentralise water management and to consolidate its administration under one ministry. It established the National Water Authority (NWA) that is composed of representatives from key government ministries, from industry, from water users associations and individuals on Swazi Nation Land. The Department of Water Affairs is secretariat for the NWA. The act also establishes five river basin authorities through which basin specific water management processes will evolve. RBAs will empower basin stakeholders in the management of their water resources. The Act declares all water found in the country a national resource and requires all users to have permit for use of the water. It is, however, not necessary for any person or community to obtain a permit for use of water for primary (subsistence) purpose. The Water Apportionment Board is responsible for issuing of permits, and the five river basin authorities will take over this function once they are all established and operating. Water is allocated on volumetric basis, and in the case of irrigation it is allocated on the basis of crop water requirement. The implementation of the NAS with its heavy reliance on irrigation expansion will directly impact on the Act. All new irrigation projects must be in compliance with the Act in terms of water allocation and abstraction. The establishment of the river basin authorities in 2009 has passed down water management responsibilities to the basin level. Each authority is to become self sustaining through the imposition of fees and levies for water supplied and services provided. The Water Act empowers each RBA to develop its own pricing structure for the water that they allocate and manage. In terms of the 2003 Water Act, RBAs have a variety of responsibilities for monitoring water quantities and qualities within their basins.

Piece of legislation	Description / relevance to the NAS
National Trust Commission Act (1972)	The Swaziland National Trust Commission (SNTC) is a body corporate established by the SNTC Act of 1972. The Act provides for the operation of cultural institutions and the proclamation and management of national parks, monuments and related matters. The Act grants the SNTC powers to proclaim national parks and monuments. It can acquire or alienate movable and immovable property subject to this Act with the approval of the Deputy Prime Minister. Any doubts or clarification of this Act require the Minister to obtain the decision of the Ngwenyama in writing which decision shall be final and binding to all concerned. The objectives of the National Parks and Nature Reserves are outlined in Section 15 of the Act and include the promotion and conservation of indigenous animals and plants and the protection of the natural ecology and environment of the park or reserve. These parks and reserves are to be controlled and supervised by the Swaziland National Trust Commission (Section 6). The establishment of this Commission is mentioned in Section 3. Activities that are destructive to the existence of these parks and reserves (as set out in the Objectives in Section 15) are prohibited. Prohibited activities are listed in Section 20 and include, among many others, the killing or injuring of plants and animals, and the removal of any object from within the park or reserve. The implementation of the NAS is unlikely to impact on this Act unless NAS measures directly or indirectly affect protected areas.
Flora Protection Act (2000)	Act that establishes the lists of especially protected flora (endangered), vulnerable flora and rare flora, and establishes measures to protect it. Of relevance to the NAS implementation, any activity that may have an impact in indigenous flora (e.g. bush clearings to set up sugar cane plantations, creation of dams, construction of roads), must assess the scale of the impacts and establish appropriate mitigation measures, normally as part of an EIA.
The Protection of Fresh Water Fish Act (1938)	An Act to make provision for the protection of fresh water fish and of indirect relevance to the NAS implementation.
The Plant Control Act (1981)	An Act to make provision for the control of plants. It mainly deals with issues related to the control of plant diseases and pests, alien species, importation and exportation of plant species, weed control, insect pests in timber. It establishes lists of prohibited plants and living material, and those which require a permit. In the case of sugar cane, the whole plant, part of the plant or seeds require a permit. All trees, shrubs and vegetation, and any living or dead portion of plants, are protected under this Act. The Minister of Agriculture and Cooperatives must grant permission before removal of plants is permitted, and an environmentalist must supervise all removals, which will be confined to designated areas only. If conflicts arise between this Act and previous legislation on matters pertaining to flora, this Act will assume supremacy over other legislation. This Act is intended to be used with: The Swaziland Government Authority Act, 1992; The Forests Preservation Act, 1910; The Plant Protection Act, 1958; The Wild Mushroom Control Act, 1973; The Grass Fires Act, 1955; The Natural Reserves Act, 1951; The Game Act, 1953; and the Swaziland National Trust Commission Act, 1972.
The Game Act (1953) and The Game (Amendment) Act (1991)	Act dealing with the preservation of game in Swaziland. It includes provisions for the establishment of Game Reserves and Sanctuaries; regulates hunting seasons and methods; and exports. The Act was amended in 1991. The Act is relevant to the NAS insofar as NAS actions may have an impact on game conservation areas.

Piece of legislation	Description / relevance to the NAS
The Natural Resources Act (1951)	This Act established the Natural Resources Board (NRB) and identified its responsibilities regarding the conservation and improvement of natural resources. Current duties include soil conservation, river and stream conservation (source, course and banks) control of water (including storm water) and control of grass burning.
The Air Pollution Control Regulations (2010)	Regulations that establish air quality objectives and regulate the emission and control of atmospheric emissions. These Regulations are of relevance to the NAS as they are the basis to control stack emissions from the sugar mills.
The Water Pollution Control Regulations (2010)	Regulations that establish water quality objectives and effluent standards. These Regulations are of relevance to the NAS as they are the basis to control effluent emissions from the sugar mills and sugar cane farming.
The Waste Regulations (1999)	These Regulations regulate the: storage, collection and disposal of waste in urban areas and in waste control areas; the carriage of waste; waste disposal facilities; waste management licences; management of special waste; recovery of waste; littering and abandoned vehicles; and Waste Management Plans. No person may collect, transport, sort, recover, treat, store, dispose of or otherwise manage waste in a manner that will likely cause negative impacts. Commercial, household and industrial wastes must be disposed of at approved waste disposal facilities. It is of indirect relevance to this Strategic Environmental Assessment.
Biodiversity Conservation and Management Bill (2008)	Bill oriented to address the problems associated with the country's current fragmentation in the regulation of biodiversity. It serves as a framework law on biodiversity issues. Amongst other aspects it foresees the establishment of a Biodiversity Management Authority (BMA).
The Human Settlements Authority Act (1961) as amended in 1992 (Act No 13)	The Act establishes the Human Settlements Authority, and relates to applications for the development of human settlements and housing schemes. The Act will be applicable where company towns transform to non-company towns.
The Swaziland Administration Order (1998)	The Order stipulates that there shall be an office of Chief in such places as the Ngwenyama may designate; the Ngwenyama shall, after consultation with the Lusendvo (inner council of family) and in accordance with customary law, appoint a Chief. The functions of a Chief are, amongst other things, to: • promote the welfare of the community in his Chiefdom; • carry out any instructions given him by the Ngwenyama; • ensure that the community is informed of issues or developments which affect them as a community or as part of the Swazi Nation; • promote the prevention of the commission of any offence within his Chiefdom; • constitute a Chief's Court in accordance with customary law, exercising civil and criminal jurisdiction – with some exclusions (cases relating to witchcraft, where death is alleged to have occurred, and in relation to marriage other than under/in accordance with Swazi custom).

Piece of legislation	Description / relevance to the NAS
The Public Health Bill (1999)	The Draft Bill provides for "preventive, promotive, curative, palliative and rehabilitative" health services and the promotion of public health and a healthy environment "that is safe for human habitation and other forms of life". It's objectives are to improve the health status of people by, amongst other things: • providing health services which are relevant and accessible to all; • providing measures directed towards preventing, suppressing and treating diseases and conditions; • providing enabling provisions for establishing facilitative structures in the form of advisory and health committees; and • defining duties and responsibilities of health personnel in government, organisations or bodies, and their relationships. Included are the establishment and functions of a Public Health Advisory Board, of Hospital Advisory and Health Committees, and the appointment of other health officers; the prevention and suppression of communicable diseases; sexually transmitted infections; mental health; immunisation; clean and healthy water supplies; food supplies and hygiene; infant nutrition; control of hazardous waste materials; nuisance; sanitation; and occupational safety and health.
The Industrial Relations Act No 1 (2000) (as amended by Act No 8 of 2000 and Act No 3 of 2005)	The Act provides for the collective negotiation of terms and conditions of employment, and for the provision of dispute resolution mechanisms and related matters; it includes the administration of the Industrial Court, the establishment and composition of the Labour Advisory Board, worker and employer organisations/federations, negotiation machinery (Joint Negotiation Councils), establishment of Works Councils, collective agreements, and disputes procedures.
The Codes of Good Practice Act (2005), in respect of Section 109 of the Industrial Relations Act (2000)	The Codes lay down general principles to guide conciliators in the exercise of their powers and functions, and assist parties in dispute. Included are guidelines for the Conciliation, Mediation and Arbitration Commission (CMAC), and Codes of Good Practice for HIV/AIDS in Employment, and for Termination of Employment.
The Employment Act No 5 (1980) (as amended by Act No 4 of 1985 and Act No 5 of 1997)	The Act consolidates the law in relation to employment, and introduces provisions to improve the status of employees. It includes powers and duties of the Labour Commissioner, contracts of employment, protection of wages, registration of employers, recruitment, provisions covering the employment of women and children, and forced labour.
The Occupational Safety and Health Act No 9 (2001)	The Act provides for the safety and health of people at work and at the workplace, and for the protection of others against hazards to safety and health arising out of, or in connection with, the activities of people in the workplace. It includes the duties of employers and employees, safety and health measures (such as policy, representatives, and committees), the regulation of workplaces, notification and investigation of occupational accidents and diseases, and procedures to follow.
The Workmen's Compensation Act No 7 (1983)	The Act provides for the compensation and medical treatment of workmen who may suffer injury or contract disease in the course of their employment.
The Factory, Machinery and Construction Works Act No 17 (1972)	The Act provides for the registration of factories and the regulation of working conditions, and the use of machinery at factories. This Act protects the health of workers from adverse construction effects including dust, fumes, noise and other impurities. Contractors must ensure the safety and health of their construction workers.

Piece of legislation	Description / relevance to the NAS
The Wages Act No 16 (1964)	The Act provides for the establishment of a Wages Advisory Board and Wages Councils, for the regulation of minimum wages and conditions of employment of employees through wage regulations orders.
Electricity Act (2007)	International trends and developments necessitated the restructuring of the Electricity Supply Industry in the country. The MNRE developed new legislation to govern the electricity sector and to liberalise the electricity supply industry in the country. This included the amendment of the Electricity Act of 1963 to the Electricity Act of 2007, the formulation of Swaziland Electricity Company Act of 2007 and the Energy Regulatory Act of 2007. Liberalisation of the electricity supply industry aimed to allow new players into the sector, to stimulate competition, improve economic and operational efficiency in the industry. The Act seeks to regulate the electricity supply industry through the issuance of licences for persons generating, transmitting, distributing or supplying electricity, or importing electricity into or exporting electricity from the country. The Act also seeks to promote rural electrification as priority for power sector policy by promoting, supporting and providing rural electrification programmes through public and private sector participation. The Act seeks to promote expansion of the grid and development of off-grid electrification and maximise the economic, social and environmental benefits. The Electricity Act of 2007 provides for the regulation of the Electricity Supply Industry in Swaziland. It regulates the generation, transmission, distribution and supply of electricity. Any person generating, transmitting, distributing or supplying electricity in the country is required to be licensed by the Energy Regulatory Authority. Power activities for which a license is required are as follows: (i) generation of electricity; (ii) transmission of electricity; (iii) performing the functions of integrated power system operator; (iv) distribution of electricity; (v) supply of electricity; (vi) off-grid and mini-grid supplies of electricity; (vii) importing and exporting electricity into or outside of the Kingdom. People or entities that do not need a license to generate, transmit, distribute and supply electricity are the following:(i) any person who generates, transmits or distributes electricity for his own use; (ii) any person who sells less than 1GWh of electricity per annum to customers; (iii) off -grid and mini-grid schemes specifically exempted by the Minister under his powers. In terms of the NAS and its support for the cogeneration of electricity from biomass, the provisions of the Act relating to licences to generate power and conditions associated with that, would need to be upheld.
Energy Regulatory Authority Act (2007)	The Act establishes an independent Energy Regulatory Authority. The following powers and functions have been given to the Authority: (i) to receive and process applications for licenses; (ii) to modify / vary licenses; (iii) to approve tariffs, prices, charges and terms and conditions of operating a license; (iv) to monitor the performance and the efficiency of licensed operators.
Swaziland Electricity Company Act (2007)	The Swaziland Electricity Company Act of 2007, which converts SEB into a company called "Swaziland Electricity Company" to take over assets, liabilities, rights and obligations of SEC. The objectives of the company are to generate, transmit, distribute and supply electricity also to import and export it into and out of Swaziland. This new company will be subject to regulation by the Energy Regulatory Authority.

Piece of legislation	Description / relevance to the NAS
Treaty on development and utilisation of the water resources of the Komati River Basin between the Kingdom of Swaziland and the Government of the Republic of South Africa	This Treaty provides in principle for the development and utilization of the water resources of the Komati River Basin. In particular, it makes provision (a) for the design, construction, operation and maintenance of the water storage project comprising the Driekoppies Dam on the Lomati River and the Maguga Dam on the Komati River together with the ancillary works as set out in article 4; (b) the establishment of the Komati Basin Water Authority (KOBWA), as well as for (c) all matters related thereto. The total allocations of water to the Parties shall be established according to the provisions of article 12 and Annex 3 to the Treaty. Further provisions concern general rights and obligations of the Parties relating to the Project, the procedure to be followed in case of "vis major" and the settlement of disputes concerning the interpretation or application of the Treaty.
Treaty on the establishment and functioning of the Joint Water Commission between the Government of the Kingdom of Swaziland and the Government of the Republic of South Africa	The Joint Water Commission (JWC) Treaty between Swaziland and South Africa was concluded in 1992, and replaced the Joint Permanent Technical Committee which served as a discussion forum on matters of mutual interest since 1979. The JWC is intended to act as technical advisor to the two governments on all matters relating to the development and use of shared water resources. The functions of the JWC include: • alleviating short-term water shortages on shared rivers during drought periods; • undertaking joint or separate investigations of potential water resource developments; • developing criteria to be adopted for the allocation of water; • the prevention and control over pollution and soil erosion, and any other matters pertaining to the development of water resources and the utilisation; • acknowledging the interests of Mozambique in any water resource common to the three countries.
Tripartite Interim Agreement between the Republic of Mozambique and the Republic of South Africa and the Kingdom of Swaziland for Co-operation on the protection and sustainable utilisation of the water resources of the Incomati and Maputo watercourses	The Inco-Maputo Interim Agreement concerns the Incomati and Maputo River Catchments only, i.e. Komati, Incomati, Sabie, Crocodile, Lomati, Usuthu and Pongola Rivers and their tributaries. The agreement is based on the Revised SADC Protocol on Shared Watercourses, and reflects the principle of equitable and reasonable utilization of shared watercourses for economic and social purposes between the three countries, as well as ensuring protection of the environment. The main objective of the agreement is to promote cooperation between the countries and to ensure the protection and sustainable utilisation of the shared water resources. The agreement covers a wide spectrum of aspects, including exchange and access to information, drought and flood controls, water quality and pollution prevention, incidents of accidental pollution and other emergency situations. The agreement also guarantees the water supply for the Maputo for the foreseeable future. The agreement describes the availability of water in the two basins, and quantifies allocations for each country in terms of priority supplies (i.e. water for urban, domestic, livestock and industrial use), irrigation requirements and afforestation. The agreement concerns not only the quantity of water, but also the quality and reliability of flows to sustain the watercourses and their associated ecosystems, including the estuary. The value of the agreement lies in the setting out of baseline data on current water use in the Incomati and Maputo Basins for each country and the estimation of future requirements for Mozambique. Future requirements are subject to further studies to generate the required information to establish a comprehensive agreement. The water allocation

Piece of legislation	Description / relevance to the NAS
	figures stated in the Agreement will be applicable following commissioning of Driekoppies and Maguga Dams and the coming into effect of the Inco-Maputo Agreement which **"***shall remain in force until 2010 or until superseded for the relevant watercourse by comprehensive water agreements in the Incomati and Maputo watercourses supported by joint studies, whichever is the earlier*". The intention of this interim agreement is partly to fulfil the requirements of the Pigg's Peak Agreement where $2m^3/s$ were to be delivered at the border to meet Mozambique's water requirements on the Komati River upstream of the confluence with the Sabie River. Any water contributed by Swaziland to satisfy the requirements of the Pigg's Peak Agreement would reduce Swaziland's net water allocation under the Komati Basin Treaty. The removal of this amount of water would impact negatively on water availability to Swaziland. The situation would apply during the validity of the Inco-Maputo Interim Agreement, or until a comprehensive long-term water allocation agreement is negotiated for the Komati and Maputo River Basins. The responsibilities of the three countries are defined in Article 4, and imply that the parties shall, individually and, where appropriate, jointly, develop and adopt technical, legal, administrative, and other reasonable measures in order to, among other measures: • coordinate management plans and planned measures; • monitor and mitigate the effects of floods and droughts; • provide warning of possible floods and implement agreed upon urgent measures during flood situations; • exchange information on the water resources' quality and quantity, and the uses of water; and • implement capacity building programmes. Article 6 on the "Protection of the Environment" states that the three countries shall, individually and, where appropriate, jointly, protect and preserve the aquatic environment and ecosystems of the Incomati and Maputo watercourses, taking into account generally accepted international rules and standards. Article 7 on "Sustainable Utilization" is derived from the revised SADC Protocol and states that the three countries shall be entitled, in their respective territories, to optimal and sustainable utilization of, and benefits from, the Incomati and Maputo water resources, taking into account the interests of the other countries concerned, consistent with adequate protection of the watercourses for the benefit of present and future generations. The three countries shall coordinate their management activities by the exchange of information, and coordinate management plans and measures. This article also states that the three countries are committed to developing measures towards improvement of efficiency and rational use of water and its conservation and to promote more efficient water use through adopting better available technology. Article 13 on "Transboundary Impacts" states that any planned water resources development projects and water utilization projects (whether or not listed in Annex II "Reference Projects"), shall not commence if they, by themselves or in combination with the existing ones, have the potential of a significant transboundary impact on the watercourse. These projects may only commence if the provisions of Article 4(1) of the revised SADC Protocol, on the procedure of notifying other riparian countries of planned measures, have been complied with.

Piece of legislation	Description / relevance to the NAS
	It is quite unique that the Agreement contains an article on capacity building (Article 14), acknowledging that the three countries must have sufficient human and institutional capacity to implement and monitor this agreement. Consequently, the countries shall, individually and, where appropriate, jointly, be responsible for ensuring that capacity is developed to effectively implement this Agreement. In terms of water quality, a resolution of the Tripartite Permanent Technical Commission (TPTC) provides the following: Water quality will be managed in general within the parameters set for the resource quality that will consist of the: (a) quantity, pattern (seasonal and temporal variation), water level and assurance of in-stream flow; (b) water quality, including the physical, chemical and biological characteristics of the water; (c) character and condition of the in-stream and riparian habitat; and (d) characteristics, condition and distribution of the aquatic biota. The water quality management goals for the transboundary surface water of the Incomati and Maputo watercourses for this period should: (a) ensure that existing aquatic ecosystems are protected; (b) allow for the abstraction for use in the production of drinking water after appropriate treatment; (c) prevent significant adverse transboundary impacts; (d) prevent deterioration of the water quality of the watercourses; (e) be guided in general by water quality guideline values for the specific water use sectors; (f) at least conform to the values set for the parameters indicated in Appendix A (Short Term Water Quality Guidelines).
United Nations Framework Convention for Climate Change (UNFCCC) (1992)	United Nations framework Convention for climate change. Swaziland is a non-Annex I country, as such and also under the Kyoto Protocol (to the UNFCCC) it may benefit from the Clean Development Mechanism to reduce its carbon emissions. Certain obligations are posed on the country, such as keeping an inventory of GHGs. The UNFCCC is relevant to the NAS as climate change may have an impact on the viability of sugar cane farming; as well the NAS foresees to explore the use of the CDM in the context of co-generation in the sugar mills.
United Nations Convention on Biological Diversity (CBD) (1992)	UN Convention whose main objectives are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources. Swaziland is signatory and the SEA is the Focal Point for the Convention. Recently Swaziland has prepared the 4th National Report to the CBD Secretariat.
United Nations Convention to Combat Desertification (UNCCD)	UN Convention whose main objective is to combat desertification and mitigate the effects of drought. The Ministry of Agriculture and Cooperatives is the Focal Point for this Convention. Currently Swaziland is completing a project aimed at reducing land degradation and biodiversity loss in the Lower Usuthu River Basin area through application of sustainable land management practices.
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention)	An intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and sound use of wetlands and their resources. The SNTC is the Focal Point for this Convention.

Piece of legislation	Description / relevance to the NAS
Stockholm Convention on Persistent Organic Pollutants (POPs)	United Nations Convention for the control of the possession and generation of Persistent Organic Pollutants (POPs). This Convention is relevant to the NAS as the burning of organic matter (bagasse and sugar cane) generate dioxins and furans regulated under the Stockholm Convention, and which should be addressed by the Government's National Implementation Plan (NIP).
Revised Protocol on shared watercourse systems in the Southern African Development Community (SADC) Region (2000)	The overall objective of this Protocol is to foster closer cooperation for judicious, sustainable, and co-coordinated management, protection, and utilization of shared watercourses, and to advance the SADC agenda of regional integration and poverty alleviation. The SADC Protocol on Shared Water Systems was signed by thirteen of the fourteen SADC member states, including Swaziland, in August 2000. Member States undertake to establish appropriate institutions necessary for the effective implementation of the provisions of the protocol, including: (a) a Monitoring Unit, based at the SADC Environment and Land Management Sector; (b) River Basin Commissions between basin states and in respect of each drainage basin; (c) River Authorities or Boards in respect of each drainage basin. The main objectives of the River Basin Management Institutions are: to develop a monitoring policy for shared watercourse systems; to promote the equitable utilisation of shared watercourse systems; to formulate strategies for the development of shared water course systems, and; to monitor the execution of integrated water resource development plans in shared watercourse systems.

Annex 5: Stakeholder engagement methodology

Scoping phase

Stakeholder engagement is a key component of the StrEA. During the Scoping Stage bilateral consultations were carried out with some of the key stakeholders (see list in Annex 3) including stakeholders from Government institutions, parastatals, professional organisations, the private sector and NGOs. The aim of the bilateral interviews was to clarify uncertainties with regards to the scope and intentions of the NAS and relevant policies and regulations, as well as to start gathering concerns with regards to the environmental performance of the sugar sector in Swaziland and the potential environmental implications (positive and negative) of implementing the NAS.

Due to time limitations, and sometimes unavailability of persons, interviews could not be held with certain stakeholders at the scoping stage. These included: Roads Department, the Department of Water Affairs, Ministry of Health and Yonge Nawe (environmental NGO). These key stakeholders will nevertheless be targeted for bilateral consultations during the StrEA Study phase.

To complement the bilateral interviews during scoping, a site visit was made to the LUSIP and KDDP areas.

StrEA Study phase

For the StrEA Study stage, stakeholder engagement took place according to a combination of:

Bilateral interviews with certain key stakeholders from Government institutions, parastatals, professional organisations, civil society, NGOs and the private sector. These included key stakeholders not interviewed during the scoping stage, as well as other interviews identified as necessary.

Stakeholders' Workshop to which key stakeholders were invited (see Annex 7 for the list of participants), with the aim of exploring more in-depth the key aspects identified and alternative measures to minimise negative effects and optimise positive ones. The workshop took place on 15 April in Manzini, and background material (summary of the scoping report and agenda) were circulated beforehand to participants. The workshop agenda is presented in Annex 8 below.

The workshop followed a 'World Café' format, which allows all participants to engage in discussions on each key aspect in a small group format. The 'world café' format consists of making general presentations of the key issues under discussion (in plenary) and the splitting in thematic tables. Each table discusses one key issue and has one facilitator; discussions last for approximately 15-20 minutes. After the initial 15-20 minutes are over, participants change tables, and discuss based on the preliminary findings of the previous group. This allows all participants to discuss all (or most) key issues in small groups; people that may not be inclined to contribute in plenary discussions dominated by a few voices, will normally be able to better contribute in smaller groups. Facilitators then synthesise discussions and findings and present them at the end of the day.

Site visits – site visits during the SEA Study phase included: Ubombo Sugar estate and mill, KDDP development areas and a Farmers Association in the Big Bend area. These site visits would be complemented with interviews to stakeholders.

Annex 6: List of stakeholders engaged or consulted

SCOPING PHASE

Date	Time	Place	Name	Organisation	Position
24/02/10	15.30	Mbabane	**Strategic Environmental Assessment Kick-off Meeting**		
			Daniela Isola	European Commission	Programme Officer
			Gugulethu Dlamini	Swaziland Sugar Association	Programme Officer
			Sikhumbuzo Dlamini	Swaziland Sugar Association	Economist
			Sibusiso Malaza	RDMU	Agriculturalist
			David Myeni	RDMU	Economist
			Christof Batzlen	RDMU	Team Leader
25/02/10	14.30	Mbabane	Ms Winile Masinga	CANGO	Information Officer
26/02/10	10.00	Mbabane	Doctor Lukhele	SWADE	Chief Executive Officer
26/02/10	14.30	Mbabane	Arthur Belsey	SWADE	Project Director, LUSIP
01/03/10	10.30	Siphofaneni	Clement Gumede	Individual small cane grower	Grower
01/03/10	12.30	Siphofaneni	Ms Pamela Dlamini	World Food Programme (WFP)	Officer in Charge, Siphofaneni Office
01/03/10	13.30	Siphofaneni	Mr Ray Gama	SWADE (Siphofaneni Office)	Environmental Specialist
01/03/10	15.00	Big Bend	Mr Jerry Ndlovu	Ubombo Sugar	Agricultural Development Manager
			Mr Mandla Mahlalela	Ubombo Sugar	Corporate Risk Manager
01/03/10	15.30	Big Bend	Mr Peter Scott	Small-holders Irrigation Project (SHIP)	Irrigation Engineer
02/03/10	07.30	Big Bend	Mr John Bezuidenhout	Small sugar cane farmer	Grower
02/03/10	09.00	Liphofaneni	Mr Sabelo Gamedze	Lobovu Farmers Association	Chairman
			Mr Phillip Thwala		Supervisory Committee Chairman

Date	Time	Place	Name	Organisation	Position
			Mr Philemon Myeni		Treasurer
			Mr Lusani Gamedze		Supervisory Committee member
02/03/10	11.30	Liphofaneni	Mr Simanga Ngcamphalala	Kuhle Kutentela Investments (Pty) Ltd	Chaiman
02/03/10	16.00	Mbabane	Mr Michael Zwane	Small, Micro and Medium Enterprise Unit, Ministry of Commerce Industry and Trade	Director
03/03/10	10.00	Mbabane	Dr Derek von Wissell	NERCHA	National Executive Director
05/03/10	09.00	Mbabane	Mr Jameson Vilakati	Swaziland Environment Authority (SEA)	Executive Chairman
			Mr Ishmael Ndwandwe	Swaziland Environment Authority (SEA)	Environment Analyst
08/03/10	10.00	Mbabane	Mr Henry Shongwe	Energy Department, Ministry of Natural Resources and Energy (MNRE)	Chief Energy Officer
			Mr Moses Dlamini	Energy Department, MNRE	Energy Officer
			Mr Bongani Thusi	Energy Department, MNRE	Energy Officer
			Mr Samuel Dlamini	Energy Department, MNRE	Energy Officer
			Ms Lindiwe Ntshangase	Energy Department, MNRE	Senior Energy Officer
09/03/10	10.00	Simunye	Mr John Mark Sithebe	Royal Swaziland Sugar Corporation	Manufacturing Manager
			Mr Mark Middleton	Royal Swaziland Sugar Corporation	Distillery Manager
			Mr Phillip White	Royal Swaziland Sugar Corporation	Environmental Manager
			Mr Oloff Marais	Royal Swaziland Sugar Corporation	Energy projects
09/03/10	14.00	Tshaneni	Mr Leonard Ndlovu	Royal Swaziland Sugar Corporation Mbuluzi River Basin Authority	Water Resources Manager Member of the Mbuluzi RBA
			Mr Bernard Shongwe	Royal Swaziland Sugar Corporation Komati River Basin Authority	Water Conveyance Manager Member of the Komati RBA

Date	Time	Place	Name	Organisation	Position
			Mr Mathew McGinn	Mbuluzi Game Reserve Mbuluzi River Basin Authority	Manager Member of the Mbuluzi RBA
10/03/10	08.30	Mbabane	Mr Ishamael Ndwandwe	Swaziland Environment Authority	Environment Analyst
			Mr Mboni Dlamini	Swaziland Environment Authority	Director of Environment Assessment and Compliance
10/03/10	14.30	Mbabane	Mr Vusumuzi Simelane	Swaziland Environment Authority	POPs Project Coordinator
12/03/10	08.30	Mbabane	Ms Constance van Zydam	Swaziland Electricity Company	Environmental Manager
			Mr Luke Mswane	Swaziland Electricity Company	General Manager
			Mr James Mabundza	Swaziland Electricity Company	Customer Services and Acting General Manager
25/03/10			Mr Joe Caldeira	USA Distillers	Director

StrEA STUDY PHASE

Date	Time	Place	Name	Organisation	Position
13/04/10	08.30	Mbabane	Mr Mandla Luphondvo	World Vision	Public Relations Officer
14/04/10	08.30	Mbabane	Mr Dorrington Matiwane	Swaziland Enterprise Development Company (SEDCO)	Managing Director
14/04/10	15.00	Mbabane	Dr Mduduzi Mathunjwa	University of Swaziland	Senior Lecturer and consultant to the SEA on POPs
16/04/10	09.00	Mbabane	Mr Peter Ginindza	Swaziland Cane Growers Association (SCGA)	Executive Director
20/04/10	11.00	Tshaneni	Humphrey Nxumalo	SWADE	Agriculture Development Manager
			Simanga Sithole	Komati Farmers' Federation	
			Cynthia Ndzabandzaba	Komati Farmers' Federation	
			Boy Mkhwanazi	Umtfombo Wemphilo (FA)	
			Busisiwe Metfula	Sivukile (FA)	
			Gcinile T Mahlalela	Ntamakuphila (FA)	
			Lomcwasho N Nxumalo	Umtfombo Wemphilo (FA)	
			Phineas Magagula	Nhlangu Yavuka (FA)	
			Obed Ngwenya	Sivukile (FA)	
			Bafana Masilela	Nhlanguyavuka (FA)	
			David Mathabela	Ingcayizivela (FA)	
			Sifiso Magagula	Lubisana FA	
			Nokuthula Nkambule	Vuka Sidwashini FA	
			Sibongile Maseko	Phakama Mafucula	
20/04/10	14.30	Simunye	Nonhlanhle N Ndzinisa	Royal Swazi Sugar Corporation	Social Services Manager

Date	Time	Place	Name	Organisation	Position
			Bongiwe Radebe	Royal Swazi Sugar Corporation	Medical Services Manager
			Thuto Shongwe	Royal Swazi Sugar Corporation	
			Chris Shabangu	Royal Swazi Sugar Corporation	Outgrower Manager
21/04/10	10.30	Matata	Ms Gina	Poortside Farms	Small Cane Grower
21/04/10	12.30	Ubombo area	Idah Mavundla	Magwanyana Farmers Cooperative	
			Elizabeth Mkhaliphi	Magwanyana Farmers Cooperative	
			Appolus Masuku	Magwanyana Farmers Cooperative	
			Phindile Dube	Magwanyana Farmers Cooperative	
			John Gamedze	Ethembeni Association	
			Simon Maziya	Small Cane Grower	
			Mkrestu Gamedze	Small Cane Grower	
			Pat Ntuli	Ubombo Sugar	Extension Officer
21/04/10	14.00	Big Bend	Thabsile Kunene	Ubombo Sugar	HIV/ART Coordinator
			Mandla Mahlalela	Ubombo Sugar	Corporate Risk Control
			Anthony Domleo	Ubombo Sugar	Agricultural Manager
			Jerry Ndlovu	Ubombo Sugar	Agricultural Development Manager
10/05/10	10.00	Mbabane	Mike Matsebula	Swaziland Sugar Association	Chief Executive Officer
			Sikhumbuzo Dlamini	Swaziland Sugar Association	Economist
			Gugulethu Dlamini	Swaziland Sugar Association	Programme Officer
11/05/10	08.30	Mbabane	Beatrice Dlamini	Swaziland National AIDS Programme	Programme Manager

Annex 7: List of participants to the stakeholders' workshop

No	Name	Organisation	Position	Telephone	Email
1	Moses Duma Zwane	Swaziland Sugar Association	Crop Protection Officer	3838998	dumaz@ssa.co.sz
2	Zinhle F Dlamini	World Vision	Project Leader: environment	4041102	Zinhle.dlamini@wvi.org
3	Lynn Kota	SWADE	Environment Manager	3441672/3/4	lynnk@swade.co.sz
4	David M Myeni	RDMU	Economist	4043352	David.myeni@rdmu.org
5	Sandra Mansoor	Ministry of Economic Planning and Development	Economist	4043765	sandymansoor@yahoo.com
6	Ian Moore	Malkerns Irrigation Co	Administrator	26022350	nocmoore@africaonline.co.sz
7	Mark Middleton	RSSC	Distillery Manager	3134690	mmiddleton@rssc.co.sz
8	Bernard Shongwe	Swaziland Sugar Association	Crops Agronomist	3838998	bernards@ssa.co.sz
9	Ishmael Ndwandwe	Swaziland Environment Authority	Environmental Analyst	4046960	indwandwe@sea,org.sz
10	Sandile Gumedze	SNTC	Senior Ecologist	4161489	ecology@sntc.org,sz
11	Mandla Makhanya	SNTC	Park Manager	4161810	conservation@africaonline.co.sz
12	Vusumuzi Simelane	Swaziland Environment Authority	National Project Coordinator	4046290	vfsimelane@sea.org.sz
13	Sikhosana Hlobsile	National Meteorological Services	Climate Change Officer	4045728	hlobskhos@yahoo.com
14	Nombulelo Vilakati	National Meteorological Services	Climate Change Project Administrator	4045728/6274	climatechange@swazimet.gov.sz
15	John W Creamer	USA Distillers (PTY) Ltd	Administration & New Projects Manager	3646057/8/9; 760	jcreamer@usadistillers.com
16	Mandla Mlipha	University of Swaziland	Senior Lecturer	76020968	mlipha@uniswacc.uniswa.sz
17	Noel Cooke	RDMU	Finance Manager	4043352	noel.cooke@rdmu.org
18	Chris Shabangu	RSSC	Outgrower Manager	3134265	Cshabangu@rssc.co.sz

No	Name	Organisation	Position	Telephone	Email
19	Matt McGinn	Mbuluzi Game Reserve	Manager	6150200	mbuluzi@swazi.net
20	Penny Geerdts	RDMU	Socio-economist	+27837775938	pgeerdts@mweb.co.za
21	Alfred Francis Murye	University of Swaziland	Senior Lecturer	76049394	amuyre@healthsci.uniswa.sz
22	Gugulethu Dlamini	Swaziland Sugar Association	Programme Officer	4042646	guguk@ssa.co.sz
23	Christof Batzlen	RDMU	Team Leader	4043357	Christof.batzlen@rdmu.org
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Annex 8: Agenda for the stakeholders' workshop

Strategic Environmental Assessment (StrEA) for Swaziland's National Adaptation Strategy (NAS)

Stakeholders' Workshop

15 April, 2010 – Tums Hotel, Manzini

AGENDA

08.30 – 09.00	Registration of participants	
09.00 – 09.10	Opening	RDMU
09.10 – 09.20	Workshop objectives and dynamics	Dr Juan Palerm, StrEA Team Leader
09.20 - 09.35	The Swaziland National Adaptation Strategy (NAS)	Mr David Myeni, RDMU economist
09.35 – 09.50	The EC's Sugar Accompanying Measures	Ms Daniela Isola, EC Delegation
09.50 – 10.00	Overview of key aspects identified in the scoping phase	Dr Juan Palerm, StrEA Team Leader
10.00 – 10.15	Key Aspect 1: Water availability / Climate change	Mr Rex Brown, environmental expert
10.15 – 10.30	Key Aspect 2: Long-term sustainability of small and medium-scale farmers	Dr Juan Palerm, StrEA Team Leader
10.30 – 10.50	COFFEE BREAK	
10.50 – 11.05	Key Aspect 3: Generation of Persistent Organic Pollutants (POPs) from sugar cane burning and impacts of mitigation measures	Dr Juan Palerm, StrEA Team Leader
11.05 – 11.20	Key Aspect 4: HIV/AIDS	Ms Penny Geerdts, socio-economist
11.20 – 11.35	Key Aspect 5: Impacts on biodiversity	Mr Rex Brown, environmental expert
11.35 – 11.45	World Café dynamics	Dr Juan Palerm, StrEA Team Leader
11.45 – 12.05	World Café: Round 1	
12.05 – 12.25	World Café: Round 2	
12.25 – 13.30	LUNCH BREAK	
13.30 – 13.50	World Café: Round 3	
13.50 – 14.10	World Café: Round 4	
14.10 – 14.30	World Café: Round 5	
14.30 – 14.50	COFFEE BREAK	
14.50 - 15.40	Reporting of discussion tables	Facilitators
15.40 – 15.55	Conclusions	Dr Juan Palerm, StrEA Team Leader
15.55 – 16.00	Closing	RDMU

Annex 9: Documents consulted

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Annex 10: Terms of Reference

TERMS OF REFERENCE

For the assignment of an Strategic Environment Assessment Study for the Swaziland National Adaptation Strategy (NAS)

1 BACKGROUND

Swaziland has an agricultural based economy, for which the sugar sector plays an important role. Sugar is also a key raw material for the agro-processing manufacturing sector. The sugar industry can be segmented into three parts: sugar cane growing, milling and marketing. Whilst the millers through large estates have predominantly undertaken sugar cane growing, the last decade has seen the entry of more medium and small-scale farmers. This was due to the lucrative economies of sugar cane growing as opposed to other agricultural activities. Recent developments have come to challenge this scenario. The recent European Union (EU) sugar sector reforms are a significant factor in the shift of dynamics. The sucrose price (paid to the sugar cane farmer) is a function of the final (average) sugar price obtainable from sales to different markets.

Swaziland has historically depended on the EU market for its sugar sales (through the EU-ACP Sugar Protocol), wherein Swaziland was selling about a quarter of its output at prices about three times the world market price. Given this high exposure, the EU reforms challenge the very viability of the sugar industry in Swaziland. This is more pronounced for smallholder sugar cane growers who are facing several challenges, making their operations marginally viable at the obtaining prices, and even more precarious under the mid-term outlook.

In order to adjust to the EU Sugar Market Organisation, Swaziland has prepared a National Adaptation Strategy (NAS) which is a response to the declining performance of the sugar sector and is in particular a mitigation measure against the negative effects on the sugar sector and the wider economy that will result from the reform of the European Union sugar market (EU Sugar Market Organisation). The NAS foresees activities and investments to be funded amounting to € 350 million.

The European Commission seeks to support Swaziland in the process of adaptation to the Sugar Market Organisation by co-financing important components of the NAS. One important contribution the EC will make within this adaptation process is the financing of the RDMU which is a semi-autonomous project implementation unit being in charge of the coordination and facilitation of the NAS implementation. Apart from the RDMU, a major funding contribution of the European Commission puts emphasis on the following three focal areas:

- Improving the efficiency and cost effectiveness of the Swazi sugar sector along the value chain (farmers, transporters, sugar factories and export);
- Facilitating diversification resulting in less dependency on the sugar sector;
- Supporting the decentralisation and outsourcing of services up to now provided by the sugar sector.

Further to the EC's Response Strategy to the NAS, a Multi-annual Indicative Programme to cover programmes for the period 2007-10 has been developed. In it, assistance to smallholder farmers as well as major stakeholders of the sugar sector have been prioritised

and would be financed in under the 2007 and 2008 allocation (with top-up funding in future years).

In December 2007, a consortium comprising GFA Consulting Group ULG and Harewelle International Limited has been awarded the service contract for the Restructuring and Diversification Management Unit in Swaziland, funded by the European Commission. The contract value of this service contract amounts to approximately € 3.8 million and caters for 4 long-term technical advisers and up to 130 person-months short-term experts. The contract started on 14th of January 2008.

The European Commission requires that a Strategic Environmental Assessment (SEA) to be undertaken for the preparation and implementation of the country's response strategy through the NAS. Particular emphasis will need to be made on the technical assistance that has been provided by the EC under the Accompanying Measures for the Sugar Protocol Countries (AMSPC) (through the MIP) based on the EC Country Strategy Paper (CSP) for the country. The SEA assignment will assess all the environmental effects (positive, negative, social or economic) associated with the preparation and implementation processes of the NAS actions. Particular attention will have to be given to those elements that can either foster or break the effective performance of the NAS actions such as the availability of water resources for irrigation (water hydrology, greenhouse gases & climate change), energy co-generation (co generation through sugar cane trash and residuals), and development (land tenure & land use planning, flora & fauna), infrastructure improvements (transport cost savings) improved production efficiency (farm input use pollutants, land degradation, migration) and sugar processing (standards, socio-economic impacts). Another important issue to be studied is the potential impact of HIV/AIDS on the sugar sector with a view to NAS implementation.

The implementation of the NAS is on-going with the Ministry of Economic Planning & Development (MEPD) being the leading Government agency. The EC is the contracting agency for the implementation of the MIP actions and the RDMU playing a co-ordination function. The NAS Steering Committee (NASSC) provides advice and contribution in the implementation of the NAS actions. The members of the NASSC are the MEPD (Chair), Ministry of Agriculture (MOA), Swaziland Sugar Association (SSA), Swaziland Cane Growers Association (SCGA), Ubombo Sugar, Royal Swaziland Sugar Corporation (RSSC), Swaziland Agriculture Development Enterprise (SWADE), Co-ordination Assembly of the NGOs (CANGO) and the RDMU. The NAS Working Groups (NASWGs) do the technical analysis on the proposed actions and make recommendations for endorsement by the NASSC.

2. DESCRIPTION OF THE ASSIGNMENT

2.1. Objective

The global objective of the assignment is to describe, identify and assess the likely significant impacts on the environment of the implementation of the country's NAS actions. This exercise will take into account the preparation and implementation of the EC interventions under the AMSPC and other possible alternatives to support the delivery of the NAS actions. The outcomes of this assignment should be in a position to provide the decision-makers (i.e. the Government of Swaziland (GoS), the EC, the NAS SC and other donors) with relevant information to assess the environmental challenges and consideration with regards to the implementation of the NAS actions and the sustainability of the results. This should allow that the potential environmental impacts are appropriately integrated into the mainstream implementation processes of the NAS.

2.2. Requested services for the first assignment

For this assignment, the output is the provision of 130 working days by three experts input for assessing the environmental effects of the preparation and implementation processes of the NAS actions with a view to take into account the potential environmental impact and the required measures to mitigate these effects.

2.3. Expected results

The assignment will compose of two parts, which are the scoping study and the SEA study. The initial study will identify and define the issues that will need to be addressed by the SEA study, with a particular emphasis on the preparation and implementation processes that were adopted by the NASSC and the other structures involved in the NAS. The conclusions of the scoping study will determine specifically the scope of activities, calendar and budget resources for the SEA study.

The SEA scoping study will deliver the following results;

- A description of the country's NAS response to the EU Sugar Market Response and its alternatives[62];
- A brief description of the institutional and legislative framework of the sugar sector and sugar industry in the country;
- A brief presentation of the relevant environmental policies and objectives in the country (taking into account the information provided in the CEP) and the EC framework;
- An identification of the key stakeholders in the sugar sector and their concerns;
- An identification of the country's key NAS – environment interactions;
- A description of the scope of the environmental baseline that will be undertaken;
- A presentation of the impact identification and evaluation methodologies to be used in the SEA study;
- An indication of the time-frames, and resources that will be needed to carry-out the SEA study.

The following will be the results for the SEA study:

- An environment assessment of the country's NAS, including the potential environment impacts of its implementation and its consistency with the country's and EC's environmental policies and objectives;
- Recommendations for the NAS implementation enhancement which will include performance indicators, use of technical assistance and other aid delivery methods.

2.4. Issues to be studied in the Environmental Scoping Study

2.4.1. Overview of the NAS actions and its alternatives

The consultant must describe the NAS actions. The NAS articulated 60 measures that will be implemented to support the reform of the local sugar industry to improve its efficiency and competitiveness. This is essential to ensure that the sugar industry continues to contribute to the overall country's economic growth and the participating small-holder growers derive meaningful returns from participating in the industry. The Multi-annual Indicative Programme (MIP) indicates the elements that are being supported by the EC.

[62] Other NAS stakeholders make a contribution in the implementation of the NAS actions in addition to the EC funding. There are other related activities that are supported by other donor agencies such as the AfDB and IFAD particularly under the KDDP and LUSIP. GoS also contribute in the financing of the new entrant growers under LUSIP. Ubombo Sugar has in the pipeline investment for the expansion of the mill.

The consultant will review the environmental impact of the whole strategy and further consider those actions that have been agreed upon between the GoS and the EC in particular. Some of the key elements to be assessed are the availability of water resources, land for irrigation expansion (social issues), alternative use of land, value-addition products (vinasse/Condensed Molasses Solids (CMS)[63], ethanol, etc.), co-generation (fuel-switch, CHP concept, cane trash) and social services (health, education, water & sanitation, etc.). Identify constraints that will need to be taken into account in proposing mitigation measures and other changes to the NAS actions. They will assess whether the alternatives already proposed are worth studying, or whether they should come up with different alternatives.

2.4.2. Legal, institutional and planning framework

A description must be made of the institutional and legal framework relevant for SEA preparation, including an indication of the key applicable laws (national law on the SEA), the planning processes in the framework of which the NAS was identified (e.g. in relation to land use planning, water resources, infrastructure development, etc.), the standards and norms that will have to be taken into account in the SEA study, and the role of competent institutions that should be involved. Reference should be made to existing SEA studies from other countries (if any), as well as to the programming documents for EC cooperation (including the Country Environmental Profile).

The outcome of the SEA study should influence the decisions and processes to facilitate the formulation and implementation of the following key strategies as articulated in the NAS Document;

- Improving the competitiveness of the sugar industry;
- Trade policy and pursuit of premium markets;
- Promoting productivity and the efficiency in the small-holder cane growing;
- Diversification within and outside the sugar industry;
- Social Services, welfare and labour issues;
- Mitigating impact on Government fiscal position;
- Enhancing a sustainable socioeconomic environment and cross-cutting issues;
- Institutional structures for implementation.

An overview description of the country's NAS wider policy framework must be given in order to identify other planning or policy documents which will need to be explored in the SEA study.

2.4.3. Description of the key stakeholders and their concerns

The consultants should identify the stakeholders (key groups and institutions, number of users and affected persons, environmental agencies, decentralised authorities and institutions, NGOs, representatives of the public and others – including women and traditional authorities, with a specific focus on those groups potentially affected by the potential environmental impacts of the project). These will include the sugar industry (mill groups and the cane growers), affected communities, target beneficiaries, and other related institutions to identify the socio-economic impact of the implementation of the NAS actions.

The consultant will also review records of any national public consultation processes that might have taken place in the formulation stage of the NAS and that of other relevant initiatives within the sugar sector such as work undertaken within the Lower Usuthu Irrigation Project (LUSIP). Based on these reviews and other additional consultations, the consultants should identify key stakeholders' concerns and values with respect to the NAS programme

63 The Consolidated Molasses Solids (CMS) is used as an organic fertilizer to alleviate the problem of high input costs.

under consideration. The consultants will need to agree prior with the clients (GoS, and the EC) on the stakeholder engagement strategy to be employed to avoid unnecessary conflicts or raising unrealistic expectations. The consultative processes should provide the stakeholders an opportunity to influence decisions. An education component in the stakeholder engagement processes (for those stakeholders not familiar with engagement processes) should be employed to ensure that the participating stakeholders fully understand and contribute to the process, even at the strategic level.

This assignment should focus on the key stakeholders particularly targeting directly affected and vulnerable groups as well as the key stakeholders that may not have been adequately represented in the preparation of the NAS. Records must be kept of all consultations and comments received.

2.4.4. Description of Key environmental aspects major project-environment interactions

Within this study, key environmental aspects and project-environment interactions that should be addressed in the SEA study need to be outlined. Particular attention should be paid to the (direct or indirect) impacts that are likely to be the most significant, considering the sensitivity of the environment, the pressures resulting from the actions (in the preparation as well as the implementation of the NAS) and the expectations of the stakeholders. For instance, the expansion of the irrigation development will hinge on the availability of suitable soils & additional land (land tenure issues, flora & fauna, social issues) and water resources (water hydrology, water rights). On the basis of the key environmental issues the consultants will judge whether or not an SEA study should be conducted and in which scope. Depending on the likely impact on the society, the consultants will need to determine to which extent these social impacts (these be disaggregated according to sex, age, priority or other relevant social criteria) will need to be assessed.

2.4.5. Description of the scope of the environmental baseline study

On the basis of the information obtained above, the consultants must provide indications on the scope of the environmental baseline needed for the SEA study, taking account of the potential area of influence of the NAS actions (including its indirect effects). Distinct geographical units can be proposed according to the type of expected impact (including indirect impacts). All geographical units identified must be clearly outlined and justified in line with the key strategy areas indicated in the NAS. For instance, the baseline study will include the new irrigation development expansion (land-use planning, flora & fauna, water quality & hydrology) mill expansion (increased cane production, socio-economic aspects), improved production efficiency (farm input use, farmer association structures, water resources/availability) and trade policy & premium markets (socio-economic aspects).

2.4.6. Recommendations on specific impact identification and evaluation methodologies to be used in the SEA study

The consultants should provide an indication of the impact identification and evaluation methodologies that should be applied in the SEA study. Special attention should be given to establishing a distinction between those environmental interactions that may require quantitative analysis and those for which qualitative analysis is sufficient.

2.4.7. Indication of time frame, costs and resources needed to carry out the SEA study

The consultant must assess the time that need to be allowed for the completion of the SEA study, which should include a definition of the environmental baseline, a review of possible alternatives, impact identification, impact evaluation and preparation of recommendations (including definition of mitigation / optimisation measures and the Environmental Management Plan – in Swaziland this is usually referred to as the Comprehensive Mitigation Plan (CMP)).

A description and estimation of the resources required (in terms of budget, person-days) must be provided including a breakdown of costs. If at this stage it is deemed necessary to integrate other experts with specific skills, this should be proposed in the scoping report for consideration by the EC.

2.5. SEA study

The scope of the SEA study will be agreed upon with the EC, the GoS, and the NAS structures on the basis of the results of the scoping report findings. The SEA study will include an environmental baseline study, an identification of environmental opportunities and constraints, an identification and assessment of the potential environment impacts, an analysis of performance indicators, an assessment of the institutional capacities to address the environmental challenges and the conclusions and recommendations.

2.5.1. Environmental baseline study

A description and appraisal must be made of the current state of the environment focusing on those key environmental components identified in the scoping study. The trends for the various environmental components must be identified and a projection must be made of the state of the environment in the short, medium and long-term in the assumption of the no implementation of the NAS actions. External factors must be taken into account, including the influence of other relevant sectoral policies. If the “no implementation scenario” is unrealistic the most probably “business as usual” scenario should be selected. The geographical (or mapping) units should be described, if relevant.

2.5.2. Identification and evaluation of environmental opportunities and constraints

The consultants should identify, describe and assess for each alternative those environment factors and resources that can affect (positively and negatively) the effectiveness, efficiency and the sustainability of the NAS actions. These factors may include expected impacts from other relevant sectors and policies. This part of the study should also consider the environmental issues that could potentially be addressed by the NAS actions. The study should assess if these actions will make an adequate response to these opportunities and constraints.

2.5.3. Identification and evaluation of impacts

Identify and describe the potential environment impacts and risks for each alternative being studied under the NAS, taking into consideration the views of all the key stakeholders. The significance of the impacts should be determined according to their characteristics (such as the duration, probability, magnitude, mitigability, reversibility) and the sensitivity of the environment. Those impacts which are significant should be assessed in detail taking into account;

- The views and the concerns of the stakeholders;
- The consistency with international commitments (MEA);
- The socio-economic impacts (especially vulnerable groups such as the women, destitute and the disabled);
- Compliance with environmental regulations and standards;
- Consistency with environmental objectives and policies, and;
- Their implications for sustainable development.

2.5.4. Analysis of performance indicators

The proposed performance indicators (deduced from the 60 NAS Measures and the MIP 2007 -2010) should be assessed and revised from an environmental perspective i.e. their usefulness to identify the environmental effects (both positive and negative) of the NAS implementation. Proposals should be made for the performance indicators and monitoring system.

The set of indicators may include;

- "Pressure" indicators[64];
- "State" indicators for the sectors with a direct and major link with key environmental resources (e.g. soil agriculture, water resources for irrigation)[65];
- Indicators for other specific issues, such as key institutional weaknesses identified by the SEA[66].

2.5.5. Assessment of the capacities to address environmental challenges

Assess the capacity of the Swaziland Environment Authority (SEA) and other relevant regulatory institutions to address the environmental issues especially the impacts identified in the SEA study.

2.5.6. Stakeholder engagement

The stakeholders should be engaged throughout the SEA study according to the stakeholder engagement strategy agreed upon in the scoping study.

2.5.7. Conclusions and recommendations

This chapter will summarise the key environmental issues for the sector, including policy, institutional and regulatory constraints, challenges and main recommendations. Recommendations should be prioritised and clearly addressed to the responsible stakeholders. The recommendations should include industry and community level recommendations and recommendations to the EC, the GoS, the NAS Steering Committee and delegation for future programme planning purposes. The limitations of the SEA and its assumptions should be presented. The consultants will indicate possibilities of providing technical assistance or aid modalities (e.g. projects) to address specific weaknesses in the environmental institutional, legal and policy framework and proposals for their indicators. The recommendations should take into account the views presented by the stakeholders and explain how these were integrated. In the case of concerns that were not integrated in the final recommendations, the reasons should be given. The findings of the SEA will be presented in a workshop to all relevant stakeholders.

3. WORKPLAN

The workplan will amongst other things include the following;

Scoping Report

- Fact finding/data collection;
- Review of prior public consultations and identification of key stakeholders;
- Engagement of stakeholders;
- Analysis and preparation of recommendations and scoping report.

64 For example: pesticide use in a given area (e.g. Deitamethrin as pour-on for the control of tsetse); hectares of area cleared for agriculture.

65 For example: % of groundwater samples meeting quality standards.

66 For example; number of annual environmental inspections carried-out by local authorities in industrial facilities

SEA Report

- Fact finding/data collection;
- Field trips;
- Engagement of stakeholders;
- Identification and detailed analysis of the potential environmental impacts;
- Preparation of recommendations to mitigate negative environmental effects (and constraints) and optimize positive effects (and opportunities);
- Preparation of recommendations and draft SEA report;
- Preparation of the final SEA report.

The consultants will be expected to provide a detailed workplan based on the TOR.

4. EXPERTISE REQUIRED

To carry out the assignment three experts with the following expert profile and qualification will be required:

Expert 1: Environmental Expert – Team Leader (60 work days whereas 50 WD in SZ and 10 WD home office days)

Qualification and Skills

- University degree – environmental studies, Land Use Planning, the Management of Renewable Natural Resources or equivalent
- Experience in conducting SEAs or similar environmental assessment assignments in the past 5 years
- Familiarity with the sugar sector and the sugar industry structures
- Good leadership qualities
- Fluency in both written and spoken English
- Computer literate
- Good writing and reporting capabilities.

General professional experience

- At least 10 years of working experience, of which at least 5 years have been spent in developing countries;
- Minimum of 5 years of experience in conducting environmental impact assessment studies particularly SEAs.

Specific professional experience

- Familiarity with EC Project Cycle Management is an asset;
- Experience with participatory planning is an asset;
- Previous experience in Swaziland is an asset.

Expert 2: Social -economist (35 work days)

Qualification and Skills

- University degree – Sociology, Agriculture Economics, Development Studies, Rural Development or equivalent;
- Demonstrated experience in rural participatory approaches and stakeholder consultation, including organization of workshops;
- Demonstrated experience with the small-holder agriculture sector;
- Familiarity with the sugar sector and the sugar industry structures;
- Strong background in gender related fields;

- Fluency in both written and spoken English;
- Computer literate;
- Good writing and reporting capabilities.

General professional experience

- At least 10 years of working experience, of which at least 5 years have been spent in developing countries;
- Minimum of 5 years of experience in conducting environmental/social impact assessment studies.

Specific professional experience

- Familiarity with EC Project Cycle Management is an asset;
- Experience of participatory planning is an asset;
- Previous experience in Swaziland is an asset.

Expert 3: Environmental Engineer / Agriculturalist (35 work days)

Qualification and Skills

- University degree – agriculture science, environment or equivalent;
- Demonstrated experience in the cane industry (farming or processing);
- Demonstrated experience with the small-holder agriculture sector;
- Familiarity with the sugar sector and the sugar industry structures;
- Demonstrated experience in water management, climatic change, biomass utilisation;
- Familiarity with value-addition products (vinasse/Condensed Molasses Solids (CMS), ethanol, etc.), co-generation (fuel-switch, CHP concept, cane trash;
- Fluency in both written and spoken English;
- Computer literate;
- Good writing and reporting capabilities.

General professional experience

- At least 10 years of working experience, of which at least 5 years have been spent in developing countries;
- Minimum of 5 years of experience in conducting environmental/social impact assessment studies.

Specific professional experience

- Familiarity with EC Project Cycle Management is an asset;
- Experience of participatory planning is an asset;
- Previous experience in Swaziland is an asset.

5. LOCATION AND DURATION

Starting period: The assignment will commence not later than 01 February 2010.

Duration of the assignment: The assignment will take up to 130 work-days.

Location: the consultant will be based in Mbabane under the supervision of the RDMU team. Frequent travels to the proposed sites are expected.

A tentative calendar could be as follows:

	Team Leader	Agriculturalist / environmental engineer	Socio-economist
Documentation review, prep of scoping study	6	4	2
Scoping Study			
Travel to Swaziland	1	1	0
Scoping study (site visits, interviews, etc)	12	12	8
Travel to Europe	1	1	0
Completion of scoping report	2	0	0
Preparation of SEA Study phase	4	1	3
SEA Study			
Travel to Swaziland	1	1	0
SEA Study (site visits, interviews, workshop, etc)	24	13	19
Travel to Europe	1	1	0
Finalisation of SEA Study report	8	1	3
TOTAL	**60**	**35**	**35**

6. DELIVERABLES

The consultant will prepare:

a) Scoping Report

A scoping report providing amongst other things an overview of the NAS actions and its alternatives, the legal & institutional framework and stakeholder concerns will be provided. This will also include the description of key environmental issues, baseline situation and recommendations on the methodologies that will be used for the SEA study. This report will help the GoS and the EC determine the scope of the SEA study.

(b) Final Report

A final draft report catering for the full TOR has to be submitted at the end of this assignment for comments by EC. Two weeks after having received the comments, the final report will be elaborated.

7. ADMINISTRATIVE INFORMATION

Each expert should be equipped with his/her own laptop computer. Office space will be made available by the RDMU.

The RDMU will provide transport for the period of the assignment.