Government of the Republic of Malawi

Ministry of Agriculture and Food Security
Irrigation, Rural Livelihoods and Agricultural Development Project

Final Environmental Report for Walutundu Small Scale Irrigation Scheme

May 2009
**WALUTUNDU IRRIGATION SCHEME**

1.0 Executive Summary

Initial Environmental Assessment on the establishment and operation of Walutundu Small Scale Irrigation Schemes was carried out a visit to site. Likely biophysical and social economic impacts of the scheme were predicted through consultations with communities and professional judgment. Based on size of the scheme nature of its operations and its environmental settings, it was determined that the impacts of the scheme will site specific and that they can be easily mitigated.

Activities on the establishment and operation of the irrigation schemes include; canal construction, distribution of water into irrigation plots, application of fertilizers, use of pesticides and clearing of land.

Construction of canals and distribution of irrigation water into plots introduces surface water over large areas creating favourable habitats for water borne and water washed disease. Such diseases include malaria, schistosomiasis, filariasis, onchocerciasis, diarrhoea and dysentery. The diseases make people sick reducing their work time in the field and consequently their productivity. Effects of the diseases can be reduced through chemotherapy, interrupting the life cycle of the vectors killing adult vectors with insecticides, health education and environmental management that creates unfavourable conditions for the vectors. Construction and use of toilets, use of water guard and boiling drinking water are effective in reducing negative impacts of diarrhoea and dysentery. The mitigation measures can be achieved by the communities themselves with assistance from Ministries of Health, agriculture, Irrigation and Water development and Non-governmental organizations.

Malaria, dysentery and diarrhoea are common in all the twelve schemes. Schistosomiasis, filariasis and oncocerciasis are currently not common in the schemes because of the cold weather. However, their likelihood of getting into the areas as a result of the creation of good habitat and the warming up climate is very high.
Production of bricks for brick lined canals creates open pits that turn into breeding places for water borne diseases. Curing of the bricks pollutes the air with carbon dioxide, a green house gas. The negative impacts of open pits can be mitigated through filling the pits and establishing vegetation cover on the reclaimed pits. Effects of carbon dioxide emitted into the atmosphere can be minimized through planting trees that act as carbon sinks.

Use of child labour should not be permitted in the scheme. Everybody should be given equal employment opportunity during construction of the brick lined canal.

Despite the negative impacts cited above, irrigation brings in a lot of good things such as food security, improved diets, cash income and generally improved living standards. With irrigation people can crop three times a year making them food secure. The surplus produce is sold for cash enabling farmers to obtain goods and services not available in the scheme.

Benefits provided by irrigation can be enhanced through use of high yielding seed, proper application of fertilizers both organic and inorganic, regular maintenance of canals to prevent interruptions on irrigation activities and identification of sustainable markets.
## ENVIRONMENTAL MANAGEMENT PLAN – EMP

<table>
<thead>
<tr>
<th>Activity</th>
<th>Impact identified</th>
<th>Mitigation measures</th>
<th>Time target</th>
<th>Who implements</th>
<th>Partner Institution</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction of network of canals and increased surface under water</td>
<td>Increase in mosquitoes. People suffering &amp; dying of malaria. Loss of productivity and income</td>
<td>Kill mosquito larvae and adults. Health education. Environmental management</td>
<td>On going</td>
<td>Community members</td>
<td>Min of Health Communities Min. of Agric IRLAD</td>
</tr>
<tr>
<td>2</td>
<td>Farmers standing in water during irrigation</td>
<td>People suffering from bilharzia</td>
<td>Medical treatment Interruption of parasite life cycle, Environmental management Health Education</td>
<td>Operation phase</td>
<td>Communities IRLAD</td>
<td>Min of Health Dept. of Fisheries Min of Agric.</td>
</tr>
<tr>
<td>3</td>
<td>Creation of mosquito breeding ground with introduction of network of canals</td>
<td>People suffering from elephantiasis</td>
<td>Environmental mgt. Medical treatment Surgery to remove fluids</td>
<td>On going</td>
<td>Min of Health Communities</td>
<td>Min. of agric. Min of Irrigation Min of Health</td>
</tr>
<tr>
<td>4</td>
<td>Increased area under surface water due to irrigation</td>
<td>Community members suffering from river blindness. (Onchocerciasis)</td>
<td>Environmental management Treatment with eye drops</td>
<td>Planning stage As required</td>
<td>Community members Min. of Health</td>
<td>Min of Agric Min of Irrigation Community Welfare</td>
</tr>
<tr>
<td>5</td>
<td>People drinking from canals</td>
<td>People suffering from diarrhoea and dysentery</td>
<td>Construction and use of latrines Health Education Production and administration of oral re-hydration fluids</td>
<td>Operation stage</td>
<td>Community members Min of Health</td>
<td>Dept of Social welfare IRLAD</td>
</tr>
<tr>
<td>6</td>
<td>Brick moulding</td>
<td>Open pits that are breeding grounds for water borne diseases. Children drowning in the pits</td>
<td>Reclaim open pits by re-vegetation Drain pits filled with water Health Education Treat patients</td>
<td>On going</td>
<td>Communities Min. of Health Those making bricks</td>
<td>Min. of Agric Brick makers IRLAD NGOs in the area</td>
</tr>
<tr>
<td>7</td>
<td>Brick firing</td>
<td>Deforestation Bare ground</td>
<td>Replace any tree cut Establish buffer strips</td>
<td>Construction phase</td>
<td>Community members</td>
<td>IRLAD Min. of Agric</td>
</tr>
<tr>
<td></td>
<td>Component / Activity / Scenario Description</td>
<td>Impact / Concern</td>
<td>Implementation Plan</td>
<td>Responsible Parties</td>
<td>Funding / Support</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------</td>
<td>------------------</td>
<td>---------------------</td>
<td>---------------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Brick transportation</td>
<td>Soil erosion</td>
<td>Reclaim roads after use</td>
<td>Brick makers, Communities</td>
<td>K10,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Air pollution</td>
<td>Use road – worth vehicles</td>
<td>IRLAD, Min. of Agric</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deterioration of water quality in streams</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Provision of equal employment opportunities</td>
<td>Men and women given chance based on qualification</td>
<td>Advertise jobs widely and encourage women to apply</td>
<td>Contractors, Communities</td>
<td>Funds for wag K80,000</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Establish footpath along main canal</td>
<td>Damage of main canal walls</td>
<td>Stabilize foot paths with grass</td>
<td>Community members, IRLAD, Min. of Agric</td>
<td>Labour contribution by communities K8,000</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Crossing points for humans</td>
<td>Damage of canal at crossing points</td>
<td>Use portable bridges on identified points</td>
<td>Community members, IRLAD, Min. of Agric</td>
<td>Pieces of wood nailed together into a portable bridge K9000</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Use of pesticides and fertilizers</td>
<td>Water pollution</td>
<td>Use pesticides and fertilizers wisely</td>
<td>Community members, IRLAD, Min. of Agric</td>
<td>K800,000</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Use of vetiver grass</td>
<td>Control of erosion on area for scheme extension</td>
<td>Construct and stabilize marker ridges with vetiver</td>
<td>Farmers, IRLAD, IRAD, Min. of Agric, Min. of Irr.</td>
<td>Vetiver grass K10,000</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Community members bathing and washing in canal</td>
<td>People will damage canal as they get in and out</td>
<td>Communities to construct bathing/washing canals away from main canal</td>
<td>Community members, IRLAD, Min. of Agric, Dept. of Social welfare, NGOs</td>
<td>Labour – Community contribution K9000</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Children urinating and defecating in main canals</td>
<td>Spread of diarrheal diseases</td>
<td>Communities to build and use toilets.</td>
<td>Life of project, Communities, IRLAD, Min. of Health, Min. of Agric, IRLAD</td>
<td>Labour contribution by communities K10,000</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Catchment conservation</td>
<td>Reduced runoff</td>
<td>No cutting of trees</td>
<td>Community members, Forestry Dept, Min. of Agriculture</td>
<td>K65,000 (for training)</td>
<td></td>
</tr>
</tbody>
</table>
ACRONYMS

ADD    Agriculture Development Division

EIA    Environmental Impact Assessment

EPA    Extension Planning Area

EMA    Environmental Management Act

FAO    Food and Agriculture Organization

NEAP   National Environmental Action Plan

NEP    National Environmental Policy

IEA    Initial Environmental Assessment

NIPDS  National Irrigation Policy Development Strategy

WHO    World Health Organization
1.1 INTRODUCTION

The Government of Malawi through Ministry of Agriculture and Food security and the IRLAD project intends to raise peoples’ living standards by enabling them to attain food security and cash income through irrigation. The proposed Walutundu Irrigation Scheme is one of the twelve small scale irrigation schemes to be established in Chitipa and Rumphi districts in the northern region.

The proposed Walutundu Irrigation Site is in Katowo Extension Planning Area (EPA), Chisimuka section, Rumphi District in Mzuzu Agricultural Development Division (ADD). The scheme is in Group Village Headman Walutundu. There are three villages participating in the scheme. The site that is 72 km from Rumphi District Assembly started in 2005 on self help basis. The scheme draws its water from the Hewe River that is perennial.

Since Walutundu scheme is a small Scale irrigation scheme with environmental impacts that are not extensive or severe and have mitigation measures that can be implemented easily and effectively, the Scheme only needed an Initial Environmental Assessment instead of full fledged Environmental Impact Assessment (EIA).

1.1 Objective of Initial Environmental Assessment (IEA)

The objective of the IEA is to identify and come up with mitigation measures for negative impacts and enhance positive ones. This is with reference to the biophysical and social economic components of the environment such as health, cultural heritage, water quality, food security, soil erosion catchment conservation, air pollution and local economy. The base line information generated in the exercise is essential for making informed decisions during the process of
integrating environmental considerations in the planning, construction and operation phases of the scheme.

1.2. Methodology

The exercise was carried out through consultations with the beneficiaries during a visit to the scheme. Physical checks on the prevailing biological, physical and social status in the scheme were also undertaken through observations. Literature review particularly focused but not limited to the various government policies and acts that make EIA a requirement for irrigation projects as outlined below.

1.2.1 The National Environmental Action plan (NEAP)

NEAP outlines environmental problems such as soil erosion, deforestation, water resources degradation and depletion, depletion of water resources and air pollution that are closely connected to irrigation and goes on to suggest how adequate environmental protection can be attained.

1.2.2 The National Environmental Policy (NEP) 1996

The irrigation sector of the NEAP aims to promote environmental sound agricultural development by ensuring sustainable crop and livestock production through sustainable environmental management techniques; it also provides pertinent guiding principles on how to increase crop production without compromising environmental quality.

1.2.3 Malawi Environmental Impact Assessment Guidelines (1997)

The Malawi Environmental assessment Guidelines together with the EIA guidelines for Irrigation and Drainage Project were reviewed as they provide important background information on how to conduct EIA.
1.2.4 The National Irrigation Policy and Development Strategy NIPSDS (2000)

The policy was also drawn upon since it clearly spells out the vision of the Department of Irrigation that is to achieve prosperity through irrigation by 2020 and provides guidelines on appropriate environmental management techniques that will sustain the desired production and prosperity.

1.2.5 The Environmental Management Act EMA (1996)

This is the major national environmental legislation that provides important generic guidelines on environmental management as well as conservation and sustainable utilization of natural resources.
2.0 ENVIRONMENTAL SETTING

The scheme is on previously cultivated land. Most indigenous vegetation of importance in terms of poles for building, medicine and grass for thatching are all cleared. There is one main irrigation canal diverted from Hewe River. The canal runs parallel to the irrigated fields. Over half of the scheme is planted with maize. Water is cut off from the canal in the evening when it is not needed for irrigation.

Over half of the scheme is on wetland with typical wetland soils that are not easily washed away.

Farmers reported that they benefited from the scheme especially in terms of food security and cash income. Despite their positive reports most beneficiaries at the scheme did not seem out of the poverty trap yet.
3.0 CURRENT AND FUTURE ACTIVITIES ON THE SCHEME

3.1 Construction of Canals
A network of canals including the main canal will be constructed to distribute irrigation water.

3.2 Extension of the Irrigated Land
There are plans to increase the area for irrigation by shifting the main canal to about forty meters northwards of the existing one. The new canal will add a strip of land that is approximately thirty meters wide and close to a kilometer long.

3.3 Use of Vetiver
Walutundu farmers are planning of rehabilitating the area planted to vetiver grass in order to facilitate irrigation and check runoff.

3.4 Use of Fertilizers And Pesticides
Both organic and inorganic fertilizers will be used to boost crop yields.

3.5 Drinking Canal Water
Besides irrigation water from the canals is used in the homes for drinking and washing.

3.6 Catchment Conservation
The catchment of Hewe River needs to be conserved to ensure sustained availability of water for irrigation

3.7 Standing in Water During Irrigation
Farmers in Walutundu stand in water when irrigating their plots exposing themselves to water borne diseases.
4.0 ASSESSMENT OF ENVIRONMENTAL IMPACTS OF THE ACTIVITIES AND THEIR MITIGATION/ENHANCEMENT MEASURES

Distribution of water into the maize fields, creation of more land for irrigation by moving the existing main canal upwards and checking runoff together create new and extensive areas with surface water. Such conditions are ideal habitat for water borne and water washed diseases. These water related diseases include malaria, schistosomiasis, lymphatic filariasis, onchocerciasis and diarrhoeal diseases. The diseases cause a lot of suffering and loss of capacity to work among people in and around the scheme. Below are brief descriptions of the effects of the diseases and their possible mitigation measurers:

4.1 Construction Of Network Or Canals And Malaria

Construction of a network of canals for irrigation creates good breeding grounds for mosquitoes increasing the risk of people contracting malaria

Malaria has a big socio-economic importance in the scheme considering the number of those who get sick and lose time that should otherwise been used productively. Again malaria is among the major killer diseases in the scheme with an importance rating of –2

4.1.1 Mitigation Measures

Mitigation measures include killing larvae and adult mosquitoes with chemicals, Mosquito proofing house, sleeping in mosquito nets and medical treatment.

4.2 Standing In Water And Schistosomiasis (Bilharzias)

Flood irrigation requires farmers to stand in water when irrigating their plots exposing themselves to infection by bilharzias parasites
The disease is common among children as well as adults that play or spend sometime in stagnant water. It does not cause death immediately but if infection is not treated for a long time, the bilharzias parasites live in and damage organs such as the liver, reproductive organs, the bladder and kidneys. It is often the damage of organs that may later cause death of the victim. The health problem has a reported to be widespread among children and is given a significance rating of -2.

4.2.1 Mitigation Measures

Suffering from bilharzias can reduced through medical treatment that includes surgery in severe cases. Cutting irrigation water from canals and draining swamps are good preventive measures.

4.3 Bathing In Fast Flowing Water In Scheme And Onchocerciasis (River Blindness)

Onchocerciasis is caused by simullid black fly that breeds in fast flowing oxygenated water. People contract it by swimming or bathing in infested waters and end up developing eye problems. If not treated on time patients lose eye sight. There is, currently, no history of people suffering from the disease but its likelihood of being introduced into the area is high having an importance rating of -1.

4.3.1 Mitigation Measures

Creation of situation where irrigation water flows fast enough harbors black flies that cause river blindness should be avoided as a preventive measure. Medical treatment should be sough by patients. Medical treatment includes surgery and use of eye ointments.
4.4 Construction Of A Network Of Canals And Filariasis (Lymphatic Elephantiasis)

Lymphatic filariasis is caused by parasitic filarial worms which live in lymph vessels. The worms block the vessels leading to the swelling of limbs (elephantiasis), enlargement of the stomach and male genital organs. This condition limits patients in terms of agricultural production. The culicine mosquito is the major transmitter of the worms but the anopheles also dose at times.

Despite the fact that there is no history of the diseases in the area, it likelihood of getting into the scheme is moderate -1. In such circumstances mitigation measures need to be put in place just in case the disease finds its way into the area.

4.4.1 Mitigation And Enhancement Measures

Preventive measures against contracting the diseases such as mosquito proofing of houses, sleeping in a mosquito nets and health education that will help people effectively control the vectors and reduce personal risks of catching the disease should be advocated.

Environmental modification and environmental manipulation strategies which aim at destroying or reducing vector habitat such as draining swamps, just using sufficient water and cutting off water from canals after irrigation should be promoted among community members.

Interrupting vectors' life cycle by using biological or chemical means and killing vectors by spraying them with insecticides are also very effective.
4.5 Drinking water from Canals and Diarrhoeal Diseases (Diarrhoea Dysentery)

Community members in Walutundu drink water straight from Hewe River without boiling it or purifying it with water guard. Yet the water is contaminated with germs that cause diarrhoeal diseases.

Diarrhoea patients open bowels and lose a lot of body fluids in the process. Loss of body fluids can cause death particularly among children. Causative agents of the disease are transmitted through contaminated food and drinking water. It was learnt during the meeting that many people wash, bathe and drink from Hewe River and that the disease is common in the scheme with a significance rating of –2.

4.5.1 Possible Mitigation Measures

1. **Education** – the effects of the disease can be reduced through education where people are told to observe hygienic practices such as washing hands after using the toilet, washing fruits, washing hands when about to prepare food or feed someone, and boiling drinking water. Boiling drinking gets rid of harmful germs.

2. **Proper use of fertilizer** - people should be trained on how to use just the right amounts of fertilizers and prevent the applied fertilizer from washing away into canals and streams where it ends up contaminating sources of drinking water.

3. **Improved sanitation** – people should be encouraged to construct and use toilets and observe general cleanliness at the household level.

4. **Water supplies** – community members in the irrigation schemes should be provided with safe water drinking sources such as protected shallow wells and gravity fed piped water,
4.6 Soil Erosion and Sedimentation of Catchments

4.6.1 Integrated Catchment Conservation
Walutundu irrigation scheme is close to the catchment/source of Hewe River. Though the catchment is within a protected area, possibilities of people cutting and collecting wood from the catchment are high. The collection of wood may cause deforestation and a reduction in water resources due to sedimentation of streams.

4.6.1.1 Mitigation Measure
Considering the fundamental hydrological functions of catchments as regulators of water regimes, ground water recharge, water quality improvement, and flood control, it will be necessary to conserve the areas using the integrated approach. Integrated catchment management is based on the understanding that water is an integral part of the ecosystem, a natural resource, and a social and economic good whose quantity and quality determine the nature of its use.

The approach requires that all the stakeholders should be involved in the planning, and implementation of conservation activities. There is need for effective coordination and collaboration among all stakeholders, full awareness and understanding of environmental problems that come with poorly managed catchments and rules and regulations (by-laws) that support catchment conservation.

Establish a multi stakeholder team of experts that should be charged with the responsibility of managing the catchment. Experts should come from the community, NGOs and government departments. These should be trained members or should be provided training where necessary to build their capacity. The existing Water Users Association with experts from agriculture and forestry could make such a team.
The team of experts should, through a consultative process involving community members, and different sectors, identify problems in the catchment that are interfering or likely to interfere with the hydrology of the area and formulate workable solutions to the problems. Planting trees, letting the indigenous trees regenerate, and promoting ridging on contour where there are gardens are some of the many solutions work in catchment conservation.

Active and Effective participation of the entire community and relevant sectors should be encouraged in all catchment management activities. Naturally good collaboration between various sectors and local people increases the chances of success in achieving natural resources conservation at the community level.

Implementation of the integrated catchment management requires the support of appropriate rules and regulations (by-laws) that are formulated by community members themselves. Preventing people from opening up new gardens in the catchment, requiring those that have gardens in the catchment to ridge on contour and preventing people from cutting down trees in the catchment are some of the possible by-laws. Walutundu gets its water from a protected area the other side of Nyika. The best conservation strategy for the area is co-management where the authority and responsibility is shared between government and communities.

4.6.2 Use of vetiver for Soil Erosion Control

The additional section of Walutundu Irrigation scheme is significantly steep. If cultivated without the necessary land and water conservation measures, the area of extension will be a big source of sediments into the canals with an importance rating of -4.

4.6.2.1 Mitigation/Enhancement Measure

In order to control soil loss, there is need peg and construct marker ridges. Vetiver grass should be used to stabilize the marker ridges. All ridges should be aligned to the marker ridges. There is need however, to supply vetiver grass on some marker ridges where the grass has died off.
5.0 BENEFITS THAT COME WITH IRRIGATION

5.1 Benefits from crop production and sale

Community members cited food security, and cash income realized from sale of surplus produce as significant positive impacts. The cash enables them access goods and services not available at the scheme. The result is that they are leading better and more comfortable lives now that they are food secure and have money.

5.1.1 Enhancement Measure

Benefits realized from produce from the scheme can be enhanced through training of farmers on good agricultural practices such as use of high yielding seed, application of inputs and identification of reliable market. Farmers should assisted on acquire inputs such as inorganic fertilizers and pesticides. These are among the limiting factors to boost production in the scheme.
6.0 ENVIRONMENTAL IMPACT ASSESSMENT OF A BRICKLINED CANAL

At present earth canals (main and secondary) are used to distribute water to various irrigation plots in the scheme. It is, however, proposed that within the near future, the main canal should be brick lined. The brick lined canal was chosen after sprinkler and galvanized pipe canals were found to be expensive.

6.1 The Brick Lined Canal

The proposed Walutundu irrigation scheme is on a narrow gently slopping wetland associated with Hewe River. Signs of erosion were noticed particularly on the northern section of scheme where the new main canal will pass. Based on the prevailing environmental conditions, a brick lined main canal is the best option for the scheme. Brick lined canals are erosion resistant and therefore suitable for places with steep slopes, erodible soils and prolonged flows a condition likely to prevail in the scheme.

Brick lined/concrete canals, if well maintained have an added advantage over earth canals in that grass does not easily grow in them reducing chances of the existence of water snails. Water velocities are usually just high enough to eliminating chances of mosquitoes breeding in the canals. When water supply is cut off, after irrigation, the canals quickly and completely dries up leaving no habitat for vectors of water borne vectors.

Generally a brick lined canal improves environmental performance of an irrigation scheme and is important for the schemes sustainability. Agricultural as well as monetary benefits derived from a brick lined canal can be enhanced through frequent monitoring and maintenance of the canal.
Despite the benefits farmers get from brick lined canals, there are a number of negative impacts that the construction and operation of the canal brings about. Some of the most likely impacts and their possible mitigation and enhancement measures are outlined below.

6.2 Brick Moulding

Bricks for the construction of the canal will have to be sourced from the scheme or adjacent areas. Whatever the source, moulding of bricks will require excavation of soil from somewhere. The excavations if not reclaimed make the landscape look ugly but most significantly they are a health hazard. Excavations that are not reclaimed often fill up with rainwater creating favourable habitats for mosquitoes, water snails and other water related diseases. They are also attractive to children who come to swim in the pools and get infected by the diseases in the process. Children have, in some cases, drowned in such pools of water. Elders who come to wash clothes get in contact with water infested by disease and get infected in the process.

Another method for moulding bricks does not live ditches but renders productive agricultural land useless because it uses top soil. This often happens on land of poor people who are compensated very little money for the destruction of their gardens.

As can be noted, open pit left after brick making can bring about sickness, death and turn productive land into a useless one. The problem has an importance rating of -4

6.2.1 Possible Mitigation Measures

It should be mandatory for community members as well as individuals in the business of brick making to rehabilitate the brick making sites when abandoning
them. The rehabilitation process includes filling up the ditches with soil and establishment of vegetative cover that will minimize runoff, erosion and sediment yield from the disturbed area. Habitats for water borne diseases will not be there and risks of children drowning will be eliminated.

Production of bricks using topsoil from agricultural land should be discouraged. Cement bricks/blocks are the most environmentally friendly if it were not for the initial high cost. Community members should be requested to contribute to the project by collecting sand and making the cement bricks. IRLAD should consider providing cement.

6.3 Brick Firing

Fuel wood for burning bricks for the construction of the canal will be cut from somewhere causing deforestation. Deforestation leaves soil bare and negatively impacting water quality by causing erosion, raising sediment/turbidity levels and dissolved nutrient concentrations in streams. Vegetation removal also raises water temperature that negatively affects aquatic life

The burning of wood in brick kilns turns trees (fire wood) from being carbon sinks into carbon dioxide sources that is emitted into the atmosphere where it contributes to global warming and consequently climate change. Climate change brings about numerous ecological and socio-economic problems. The contribution of carbon dioxide into the atmosphere from Walutundu may not be immediately felt at local level but it is significant (-3) at national and regional levels in form of erratic rains, frequent and severe floods and droughts.

6.3.1 Possible Mitigation/Enhancement Measures

Problems of erosion, increased sedimentation, turbidity and raised temperatures in streams due to removal of trees can be reduced through taking precautions
such as proper timing when trees can be cut and determining the site sensitivity of the area for minimum environmental impact. Such precautions include avoiding cutting trees from steep slopes that may lead to soil loss and removal of trees near streams where they shade watercourses keeping the water temperatures favourable for aquatic life. A 30 meters wide riparian zone on both sides of streams to filter out sediments and other pollutants should be established where no trees should be cut. This could be in the catchment of the main river for irrigation or community forest areas.

Planting trees to replace those that have been cut for fire wood and allowing regeneration (coppices) will promote carbon sequestration and minimize the impact carbon dioxide as a green house gas.

6.4 Brick Transportation

Transportation of bricks to the canal site will need construction of temporary roads that are likely to disturb the soil, damage vegetation along the road and cause erosion and sedimentation of adjacent streams. Footpaths have, to some extent, the same effects as temporary roads. Vehicles used will burn fossil fuels polluting the air with green house gases. The issue of brick transportation has a significance rating of -3.

6.4.1 Possible Mitigation/Enhancement Measures

Soil loss and stream sedimentation problems that are caused by temporary roads/foot paths can be reduced by planting grass and shrubs that will quickly and adequately restore drainage and soil stability of the area (roads) when no longer in use. Usually indigenous grass and tree species found in the area are the best for re-vegetation purposes.
If Walutundu irrigation scheme has to use trucks to transport bricks from source to the canal site, only regularly serviced vehicles with minimum exhaust emissions should be hired to minimize air pollution.

6.5 Use Of Child Labour

Walutundu irrigation scheme will have a variety of activities during the construction and operation phases of the canal. Major activities during the construction phase include clearing the route of the canal, excavation of the canal, ferrying bricks and sand to the site. When the canal is operational, there will be need to manually regulate flow of water, protect the canal from destruction by both human beings and animals and monitoring the daily status of the canal. These tasks require the active participation of everybody; men women and children. Some parents may however, be tempted to assign irrigation related chores that are beyond their children’s ages and capabilities. The assignments may also be given at wrong times. The danger is that if this happens children lose interest in school, their concentration and class performance deteriorates. Use of child labour is a serious problem with a significance rating of -4

6.5.1 Possible Mitigation And Enhancement Measures

Child labour where children are required to carry out assignments beyond their ages and capabilities is prohibited in the Malawi. Parents in Walutundu simply need to adhere to the regulation. Children of school going age must be in school and their schoolwork should come first before irrigation/canal chores.

Children of school going age should, however, not be completely barred from canal work. They can and should be encouraged to assist with canal work when they are free from schoolwork provided that the work assigned to them is not beyond their ages and capability. Their mixing with adults when irrigating or maintaining the canal is important for it provides the children with informal
education that will enable them acquire knowledge and skills that they will need in future. Such informal settings allow children to constantly learn by picking up bits of information here and there, by trial and error and by conversation. Children in Walutundu scheme should not be denied this important and enriching experience.

6.6 **Provision Of Equal Job Opportunities**

Construction of the main canal will create a lot of jobs both at community and contractor levels. This includes the paid and voluntary jobs. Possible tasks (jobs) will include surveying the route of the canal, clearing the route, excavating the canal, bricklaying and general supervision of work on site. Culturally the tasks mentioned above were, in the past, regarded as exclusively for men. Fortunately things changed, many women are now trained to undertake what used to be men’s jobs.

6.6.1 **Possible Mitigation & Enhancement Measures**

In order to provide equal job opportunity to both men and women, the jobs should be advertised wildly within the Walutundu community and Rumphi district as a whole. Women should be encouraged to apply and those capable should be given a chance. There are currently a lot of women trained in irrigation, brick laying, administration and many other fields. It will, therefore be unfair to have men monopolize jobs during construction of the canal. If there are no female bricklayers in Walutundu, there will be at least one in Rumphi as a district.

6.7 **Establishment Of Footpaths Along The Main Canal**

Farmers will need to walk along both sides of the main canal when irrigating, removing debris and carrying out maintenance work such as clearing the canal and mowing. Although the canal is narrow, people will naturally walk and work from both sides of the canal.
For the convenience of farmers footpaths should be located on both sides of the canal. The footpaths need to be done carefully because if poorly done they may expose bare ground resulting in surface runoff, soil loss and the weakening and collapse of the sides of the canal a problem that has a significance rating of -2.

6.7.1 Possible Mitigation & Enhancement Measures

For farmers’ convenience, the design should incorporate provision of foot paths on both sides of canals. To prevent the weakening and collapse of the canal due to use of footpaths, the design should ensure that the embankment forming the footpaths are properly designed and constructed. Farmers should also be advised to maintain the foot paths’ deterioration due to wear and tear as a result of splash erosion, runoff and trampling forces.

6.8 People Crossing Main Canal

People cannot be expected to walk the length of the main canal when going to the other side of the canal. In the absence of designated crossing points, people will try and cross the canal from any point they consider suitable. This will weaken the walls of the canal in areas where people cross increasing the maintenance costs. It may also result in children injuring themselves as they cross the canal following their parents in irrigation plots. Houses are very close to the scheme. In such circumstances chances of children following their parents in the fields are high. This problem is localized with a significance of -2

6.8.1 Possible Mitigation And Enhancement Measures

Several crossing points should be identified along the canal. Already farmers in Walutundu cross the existing main canal by laying two to three logs across the canal. Nailing the logs together would improve the situation by converting them
into movable wooden bridges. The points should be located on suitable sites such as areas where erosion potential is low and canal crossing is likely to be frequent.

6.9 Effects Of Change In Slope Of The Canal

Changes in slope of canals cause erosion if velocity is too high while low velocities may cause water to stagnate creating favourable habitats for water snails as well as providing breeding places for mosquitoes. In Walutundu the shift of the main canal northwards may bring deviations from the recommended grades. The issue is again localized with an importance rating of -2.

6.9.1 Possible Mitigation & Enhancement Measures

Where possible the initial canal routes with the recommended slope and water velocities should be maintained. The velocities should not be so high as to cause erosion and scouring but should not be too low as to allow breeding of water snails and mosquitoes.

6.10 Children Bathing/Washing In Main Canal

The main canal in Walutundu runs very close to houses. Bathing for adults is therefore out of question. However children will certainly want to play in the canal and women will wash in the canal. Both the children and the women bathing/washing in the canal may weaken and damage the canal calling for expensive repairs.

6.10.1 Possible Mitigation & Enhancement Measures

Community members should put up and look after bathing/washing places in places that are convenient to them. Such places could be shallow wells or water holes located away from the main canal preferably at the end of the canal. High,
but none erosive velocities need to be maintained in the bathing/washing water holes in order to keep them free from water snails and mosquitoes.

6.11 Community Members Drinking Contaminated Water

Water from taps, boreholes and protected shallow wells is usually safer for drinking and washing than surface water. Community members in Walutundu will, continue using Hebe river and water from canals for drinking and washing unless they are provided with safe and more convenient sources of water. The situation will continue to expose community members to water borne disease rated at a significance of -2

6.11.1 Possible Mitigation & Enhancement Measures

Problems of safe drinking water in Walutundu irrigation scheme can be minimized by provision of boreholes. Gravity fed piped water would be expensive because the source of the river Hebe is very far and would necessitate use of a lot of pipes. Water supply could be done easily and efficiently if Ministry of Agriculture and Ministry of Irrigation and Water development can work together complementing each others’ development work.

6.12 Flooding And Water Logging

Walutundu irrigation scheme is in a low laying wetland. A slight rise in the water levels in Hewe River will flood more than half the scheme resulting in severe soil erosion and crop damage.

Pools of water were seen in many places in the scheme in the dry season. This suggests that water logging should be severe in the wet season.
6.12.1 Mitigation Measure

Farmers should be assisted design and construction of canals that will drain water away from the scheme back into Hewe River.

6.13 Use of Fertilizers and Pesticides

The scheme is small and very little amounts of fertilizer and pesticides are used. These have no effect on water quality downstream.

6.13.1 Possible Mitigation Measure

Farmers should be trained to use recommended amounts of fertilizers and pesticides at the right time. Measures to prevent the chemicals from washing away should be put in place. Ministry of Agriculture and Food Security can advise on the right interventions.
## ENVIRONMENTAL MANAGEMENT PLAN – EMP

<table>
<thead>
<tr>
<th>Activity</th>
<th>Impact identified</th>
<th>Mitigation measures</th>
<th>Time target</th>
<th>Who implements</th>
<th>Partner Institution</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Introduction of network of canals and increased surface under water</td>
<td>Increase in mosquitoes. People suffering &amp; dying of malaria. Loss of productivity and income</td>
<td>Kill mosquito larvae and adults. Health education. Environmental management</td>
<td>On going</td>
<td>Community members</td>
<td>Min of Health Communities Min. of Agric IRLAD</td>
<td>Chemicals and teaching/learning materials K50,000</td>
</tr>
<tr>
<td>2  Farmers standing in water during irrigation</td>
<td>People suffering from bilharzia</td>
<td>Medical treatment Interruption of parasite life cycle, Environmental management Health Education</td>
<td>Operation phase</td>
<td>Communities IRLAD</td>
<td>Min of Health Dept. of Fisheries Min of Agric.</td>
<td>Drugs Teaching/learning materials K25,000</td>
</tr>
<tr>
<td>3  Creation of mosquito breeding ground with introduction of network of canals</td>
<td>People suffering from elephantiasis</td>
<td>Environmental mgt. Medical treatment Surgery to remove fluids</td>
<td>On going</td>
<td>Min of Health Communities</td>
<td>Min. of agric. Min of Irrigation Min of Health</td>
<td>Personnel Medical drugs K25,000</td>
</tr>
<tr>
<td>4  Increased area under surface water due to irrigation</td>
<td>Community members suffering from river blindness. (Onchocerciasis)</td>
<td>Environmental management Treatment with eye drops</td>
<td>Planning stage</td>
<td>Community members Min. of Health</td>
<td>Min of Agric Min of Irrigation Community Welfare</td>
<td>Trained personnel Medical drugs</td>
</tr>
<tr>
<td>5  People drinking from canals</td>
<td>People suffering from diarrhoea and dysentry</td>
<td>Construction and use of latrines Health Education Production and administration of oral re-hydration fluids</td>
<td>Operation stage</td>
<td>Community members Min. of Health</td>
<td>Dept of Social welfare IRLAD</td>
<td>Health trained personnel Drugs availability in hospitals and Health centres</td>
</tr>
<tr>
<td>6  Brick moulding</td>
<td>Open pits that are breeding grounds for water borne diseases. Children drowning in the pits</td>
<td>Reclaim open pits by re-vegetation Drain pits filled with water Health Education Treat patients</td>
<td>On going</td>
<td>Communities Min. of Health Those making bricks</td>
<td>Min. of Agric Brick makers IRLAD NGOs in the area</td>
<td>Trained personnel Medical drugs K8,000</td>
</tr>
<tr>
<td>7  Brick firing</td>
<td>Deforestation Bare ground Soil loss Emission of green</td>
<td>Replace any tree cut Establish buffer strips on both sides of rivers Don't cut trees near</td>
<td>Construction phase</td>
<td>Community members Brick makers IRLAD</td>
<td>IRLAD Min. of Agric Min. of Irrigation</td>
<td>Tree seedlings Labour contribution from community K10,000</td>
</tr>
<tr>
<td>Activity</td>
<td>Impact identified</td>
<td>Mitigation measures</td>
<td>Time target</td>
<td>Who implements</td>
<td>Partner Institution</td>
<td>Resources</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>-------------------------------------</td>
<td>---------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>8 Brick transportation</td>
<td>Soil erosion</td>
<td>Reclaim roads after use</td>
<td>When finished with the roads</td>
<td>Brick makers Communities</td>
<td>Communities</td>
<td>Community members K8,000</td>
</tr>
<tr>
<td></td>
<td>Air pollution</td>
<td>Use road – worth vehicles</td>
<td></td>
<td>Communities IRLAD</td>
<td>Min. of Agric</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deterioration of water quality in streams</td>
<td></td>
<td></td>
<td>Community members</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Provision of equal employment opportunities</td>
<td>Men and women given chance based on qualification</td>
<td>Advertise jobs widely and encourage women to apply</td>
<td>During canals construction</td>
<td>Contractors Communities</td>
<td>IRLAD</td>
<td>Funds for wag K 80,000</td>
</tr>
<tr>
<td>11 Establish footpath along main canal</td>
<td>Damage of main canal walls</td>
<td>Stabilize foot paths with grass</td>
<td>Constraction and operation</td>
<td>Community members</td>
<td>Min. of Agric Communities IRLAD</td>
<td>Labour contribution by communities K8,000</td>
</tr>
<tr>
<td>12 Crossing points for humans</td>
<td>Damage of canal at crossing points</td>
<td>Use portable bridges on identified points</td>
<td>After canal is completed</td>
<td>Community members</td>
<td>IRLAD, Min of Agric</td>
<td>Pieces of wood nailed together into a portable bridge K9000</td>
</tr>
<tr>
<td>13 Use of pesticides and fertilizers</td>
<td>Water pollution</td>
<td>Use pesticides and fertilizers wisely</td>
<td>On going</td>
<td>Community members</td>
<td>IRLAD</td>
<td>K600,000</td>
</tr>
<tr>
<td>14 Use of vetiver grass</td>
<td>Control of erosion on area for scheme extension</td>
<td>Construct and stabilize marker ridges with vetiver</td>
<td>During extension of scheme</td>
<td>Farmers IRLAD</td>
<td>IRAD</td>
<td>Vetiver grass K10,000</td>
</tr>
<tr>
<td>15 Community members bathing and washing in</td>
<td>People will damage canal as they get in and out</td>
<td>Communities to construct bathing/washing canals away from main canal Sink shallow wells</td>
<td>After construction of main canal</td>
<td>Community members IRLAD</td>
<td>Min. of Agric IRLAD Dept. of Social welfare, NGOs</td>
<td>Labour – Community contribution K9000</td>
</tr>
<tr>
<td>canal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Children urinating and defecating in main</td>
<td>Spread of diarrhoeal diseases</td>
<td>Communities to build and use toilets</td>
<td>Life of project</td>
<td>Communities IRLAD</td>
<td>Min. of Health</td>
<td>Labour contribution by communities K10,000</td>
</tr>
<tr>
<td>canals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min. of Agric IRLAD</td>
<td></td>
</tr>
<tr>
<td>17 Catchment conservation</td>
<td>Reduced runoff</td>
<td>No cutting of trees</td>
<td>On going</td>
<td>Community members</td>
<td>Forestry Dept</td>
<td>K65,000 (for training)</td>
</tr>
<tr>
<td></td>
<td>Reduced erosion</td>
<td>Introduce collaborative catchment conservation</td>
<td></td>
<td>Forestry Dept Communities IRLAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improved water quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.0 CONCLUSION

The Initial Environmental Assessment has established that environmental impacts the irrigation project will bring in Walutundu are insignificant, site specific and can be migrated or reversed easily. This means that the project will bring more benefits to community members in Walutundu than negative impacts. Some of the benefits include food security, cash income generated by sale of produce and a general improvement in the living standards of the people.

The negative ratings in the impact assessments are not a reflection of the current situation on the ground. They are based on the likelihood of the problems being introduced into the scheme with changes in circumstances as explained in the text. Even if introduced, their mitigation measures will be attained easily as detailed in the EMP.

The report meets government standards and requirements in carrying out an EIA by following procedures and guidelines provided in various policies and acts.
References


Environmental Affairs Department, 1997, Guidelines for Environmental Impact Assessment in Malawi, Lilongwe


Malawi Government, 1996, Environmental Management Act

Malawi Government, 1996, National Environmental Policy

Malawi Government, 2000, National Irrigation Policy and Development Strategies
Terms of Reference for Environmental Impact Assessment and Environmental Management Plan of the proposed Irrigation Scheme.

From an environmental and social safeguard point of view IRLADP is classified as Category B project. That is, the environmental and social impacts of the project are expected to be minimal, site specific and manageable to an expected level. Therefore, a preliminary environmental assessment for each proposed small-scale irrigation site shall be produced. Issues to be addressed will include but not limited to:

- Soil erosion and sedimentation in the catchment areas where the project site are located;
- Flooding and water logging;
- Water borne diseases (malaria, onchocerciasis, schistosomiasis, etc);
- Fertilizer and pesticide application;
- Effects on quality of water in downstream receptors; and
- Re-settlement of affected population if needed.

The Consultant will prepare an environmental management plan (EMP) – and incorporate its elements fully into detailed design of the scheme. Both the environmental EMP will be submitted as a part of the Feasibility Report.
**SCHEME BENEFICIARIES INTERVIEWED**

Kapoko Luhanga (lead farmer)
J Ng’ambi
L. Munthali
O.Luhanga
T. Bota
P. Luhanga
I. Luhanga
F. Kayira (mrs)
M. Luhang (mrs)
B Mwandira (ms)
L. Luhanga (mrs)
V. Chawinga (mrs)
O. Luhanga (ms)
M. Chawinga
R. Chawinga
E Chawinga
C. Luhanga
M. Zgambo
E. Mwandira
C. Mughogho
L. Chipofya
M. Mzumara
K.Chawinga
A. Chavula
M. Mkandawire
D.Phiri
E.Botha