

The Impact of Dam Construction on the Biodiversity and Ecology of Mpanga River Gorge, Kamwenge District, Western Uganda

1. Background

Uganda is endowed with a rich river system in most parts of the country. These are important sources of water for domestic, agricultural and industrial use. A number of falls along these water courses have been harnessed in a bid to increase the supply of energy to meet the increasing demand.

A proposal to develop a small hydro electric power plant on the Mpanga River Falls, Kamwenge District in western Uganda was approved. The development is being undertaken by South Asia Energy Management Systems Inc. of 30251 Golden Lantern, Stee, PMB376 Laguna Niguel, California 92677, USA. The target output is 18 mega watts and this is expected to be used in the District of Kamwenge and also added to the National grid.

An Environmental Impact Assessment (EIA) was conducted by EMA Consult Ltd and approved by NEMA on 31st May 2007, under certificate of approval No. NEMA/EIA/1269. However, Uganda Wildlife Authority (UWA) and other stakeholders raised serious concerns including impact on the threatened and endemic cycad (*Encephalartos whitelockii* P.J.H. Hurter), the diversion of water and its effect on the Mpanga falls, impact on the tourist potential of the area given that the main attraction the falls will be affected, and general inadequacy of the EIA report. UWA recommended a fresh submission of EIS for review by all stakeholders. Although a fresh EIA has not been undertaken, the development activities are underway. Three camps are at different stages of construction, the road network is crisscrossing the landscape and the damming and the canalization of water have started.

These concerns prompted *NatureUganda* to organize a team to make an on-site assessment of the situation on the ground. This team visited the construction site for three days from 15th to 18th May 2008. The team made a record of the activities going on, the damage so far caused, identified other threats to the cycads and made a quick estimate of the area covered by the cycads. An attempt was made to talk to the local communities, senior members of the construction company and the Environmental Officer of Kamwenge District.

2. Location of Mpanga gorge

Mpanga Falls is located in Nyabani Sub-county of Kamwenge District, western Uganda at the eastern edge of Queen Elizabeth National Park (QENP), north-east of Lake George. The river originates from Kibale National Park and flows through a cleft over the 50 m Mpanga falls (Fig 1). It continues along the boundary of QENP and drains into the Lake George Ramsar Site downstream. Only the part of the river from the falls down to Lake George, including a narrow strip of just about 100 yards from the river edge, is protected as part of QENP and under the jurisdiction of UWA. The cycad population is located in the Sub-county of Nyabani on the northern bank of River Mpanga, and Ntara Sub-county on the southern bank. In Nyabani Sub-county the plants are located in Rweshama Parish, in the villages of Kabeeza,

Rweshama II and Kagarama. In Ntara Sub-county they are in Karubuguma Parish in the villages of Nyakeera and Karubuguma.



Fig. 1 Mpanga River running through the gorge

3. Conservation significance

i. Endemic cycad

In the narrow gorge of the Mpanga River grows the spectacular cycad (*Encephalartos whitelockii*), which is highly threatened. The site is home to probably the biggest known single population of cycads in the whole world. This population must have enjoyed lack of disturbance to grow to such a sizeable population for a very time because the plant grows extremely slowly. This colony should be considered a national botanical treasure of irreplaceable value.



Fig. 2 Male (L) and female (R) plants of *Encephalartos whitelockii* with cones in the foreground

E. whitelockii is endemic to Uganda, known to occur nowhere else in the world. It has such a highly restricted distribution and this makes it pretty vulnerable to extinction once it gets exposed to any threat. It has a very small area of occupancy of ca. 1 km² and extent of occurrence of ca. 16 km². Like other cycads, it is a very primitive plant, hence the common reference as a “living fossil”. Uganda is blessed to have this unique plant as a national heritage and must take pride in having it within her borders for which no single effort should be spared to protect it.

Cycads are listed and therefore covered under CITES Appendix I because of the high threat to their survival arising out of habitat destruction and collection of seed and seedlings. *E. whitelockii* is rated as Vulnerable (VU B1ab(iii,v)+2ab(iii,v); D2) by IUCN, but this was when there was no known threat to their survival. With the current threats the endemic plant immediately jumps to being Critically Endangered. Uganda is a signatory to both the Convention on International Trade in Endangered species of Fauna and Flora, CITES (with Management Authority in Wildlife Division of the Ministry of Wildlife, Tourism and Antiquities) and Convention on Biological Diversity, CBD (Focal Point in NEMA). The country therefore has an obligation and responsibility to put in place and uphold regulatory mechanisms to protect threatened taxa within its borders, such as this cycad. The *E. whitelockii* is a dioecious plant i.e. an individual is either male or female (Fig 2).

Today only a handful of cycads still exist, and many are facing possible extinction in the wild. In South Africa, *Encephalartos woodii* is already extinct in the wild owing to over-collection, and only a single individual is grown in a botanic garden at Kew, England. This kind of situation must be avoided in Uganda.

ii. Other biodiversity

The Mpanga Gorge is not only important for cycads. It is home to other forms of biodiversity and the rare beetles associated with the cycads. There is also *Baphia wollastonii* Bak.f. (a tree in Papilionoidea) as well. Although *B. wollastonii* has not been evaluated by IUCN, it is an Albertine Rift Near Endemic taxon known only from Uganda and Eastern Congo (DRC). It is therefore a taxon of conservation concern demanding regional responsibility for its conservation.

There are Uganda Red Colobus monkeys (*Procolobus pennantii tephrosceles*) evaluated by IUCN as Endangered EN A2cd (IUCN 2007). It is a threatened primate, recorded near the point where the river flows over the edge into the valley (Thomas Struhsaker pers. comm.)

Baboons also occur in this area and are probably the main dispersers of the cycad seed. The plant is actually locally known as *Muhure* or *Ebinanansi by'Enkobe*- meaning "pineapples for baboons". Any impoundment of the river would flood the narrow strip of forest along this part of the Mpanga River, thereby destroying the forest and the habitat of the baboons, Endangered Red Colobus and other forest-dependent species. A comprehensive survey of the area would undoubtedly reveal more important taxa.

4. Eco-tourism significance

The combination of the endemic and extremely rare cycad, the spectacular Mpanga Falls (Fig 3) and the proximity to QENP and Kibale NP makes this part of the Mpanga River Valley a huge and important tourist attraction. The site has a very high potential for tourism development. UWA intends to develop the Mpanga falls site in partnership with the local communities, the land owners and the Kamwenge District Local Government as was indicated in UWA communication to NEMA. The UWA ranger post office reported many visits by tourists to the gorge. As a matter of fact, the first whistle blower of the destruction of the cycad and its habitat was a tourist.



Fig. 3 Mpanga Falls

5. Socio-economic issues

i. Human population

Compared to other parts of Uganda, the area along Mpanga Gorge has a medium population density, the main reason why the villages are large. The people in the area are mainly Bafumbira, Bakiga and some Banyankole, who migrated to the area, possibly in the last 30 or less years. The immigrant population may explain the increased demand for land and hence the cultivation on the escapement of the gorge.

ii. Land use and economic activities

The people adjacent to the gorge are mixed farmers, keeping livestock and practicing cultivation. Cattle keepers reserved their land for pasture but some farmers cultivate the slopes of the gorge up the river and these have largely cut all cycads on their farms. The cattle keepers also tend to burn the cycads to increase arable land.

iii. Land ownership and tenure systems

Nearly all the land on which the endemic cycad is growing is outside QENP and is thus unprotected. The land is owned privately by individuals. *The land originally belonged to the King of Toro and was given to the migrants by the King. Later, migrants started exchanging it among themselves commercially (LC 1, Ntarama).*

The developer has purchased land in which the development of the dam is taking place (Fig 4). This is the same area where most of the endemic cycad population is located. The terms of ownership of the land by the developer needs to be established. The activities in the construction site seems to indicate that the developer gives no regard to the presence of the cycads and therefore it would be most unfortunate if such a unique and Critically Endangered species of plant was left exclusively managed by such a private firm.



Fig. 4 The disturbed landscape of the hills on which construction is taking place

iv). Compensation of communities

The developer purchased land from the communities for road networks or reserving the land for the construction activities such as the dam, canals, camps, etc. Although compensation was made, some sections of the community are dissatisfied with the manner in which their property was valued and some still have claims of non-payment or unclear boundaries.

There seems to have been less involvement of Local Councils (LCs) where these developments are located and local community members in the valuation exercise. Valuation criteria were not fully explained to the community, leading to suspicion of cheating. The prices to be paid to farmers were stated to them and many community members agreed out of fear that their land would be grabbed. One land owner is already in the process of seeking legal redress.

The damming of water will cause flooding of land behind the dam (weir and intake) and the land owners have not been compensated. There is fear among the landowners upstream of the dam that part of their land will be submerged. There is fear that flooding may increase disease incidence such as malaria in the area.

v. Cultural attachment

People from surrounding communities and elsewhere visit the Mpnga falls and the hot springs in the vicinity in the Village of Nyakeera, on the lower part of the gorge. Local communities have strong cultural attachments to the falls and many are worried that the construction of the dam may "kill" the falls and/or deny them access to their cultural sites.

The local communities also indicated a belief that the "Bachwezi" (super human beings/gods) live near the falls and they are regularly consulted for blessings.

vi. Access to river and other resources

Communities use the river for fishing right within the proposed site and water their cattle from the river. The project development may interfere with the communities' activities especially after the canal has been constructed across the landscape. This is likely to breed multiple conflicts within communities (cattle keepers and cultivators) and between the developer and the community which may endanger the development itself. Communities also use the gorge area as a source of medicinal plants and again access may largely be curtailed by the canalling (headrace channel) and dam construction. The canal and the road across the steep hills will also create a barrier to livestock movement to the river.

There is concern that the diversion of the water into the canal will dry up the river, leading to water shortage downstream, especially for livestock.

The above community concerns notwithstanding, the communities view this development i.e. construction of the dam and other infrastructure like the road network, as a benefit in terms of creation of employment, improvement of the main road and opening up of others, making the area more accessible and expectation that some of the local people may be able to use the electricity

once generation begins but they are uncertain of this, given the present high electricity tariffs.

6. Environmental Impact Assessment

i. Main elements raised in the report

An EIA produced for the proposed development was highly lacking and in some sections especially the area highlighting the environmental concerns reads like a desk study. The report could be mistaken for an EIA of QENP. Ironically, UWA is not mentioned in the statement as one of the stakeholders. The report uses information from an earlier study of the proposed Dura Limestone Quarry and no indication that similar surveys were undertaken for the Mpanga Project. The consultant also assumed that biodiversity and landscape elements of Dura area in QENP plains were the same as those of Mpanga Gorge. The report barely talked about the significance of the cycads and no mitigation measures for their conservation except a recommendation for communities to plant them. The landscape and vegetation components of the gorge are pretty different from those of the Dura area and the two areas have little comparable features. The consultant should have conducted separate surveys to ascertain and characterise the uniqueness of the Mpanga gorge.

Below is a summary of the EIA analysis of the environmental concerns in Mpanga gorge and elements of impact of the dam construction.

Table E1 of the EIA report. Summary of Potential Impacts of the Small Hydropower Dam according to the EAI report

Environmental Component	Impact During Construction	Impact During Operation Phase
Vegetation and biodiversity	-ve (**)	none
Wildlife	-ve (*)	-ve (*)
Quarrying and/or Borrowing	-ve (**)	none
Hydrology, flow regime and aquatic habitat	-ve (**)	-ve (**)
Noise Pollution	-ve (*)	none
Dust Pollution (particulate matter)	-ve (*)	none
Water Pollution	-ve (**)	none
Population influx and the workers camp giving rise to the following:	-ve (**)	-ve (*)
<ul style="list-style-type: none"> • Spread of communicable diseases (e.g. STIs, HIV/AIDS, etc); • Problems of solid and sanitary wastes disposal • Increased traffic leading to accidents 		
Loss of agricultural land	-ve (**)	none
Loss of community watering points	-ve (**)	none

Loss of aesthetic features of Mpanga Falls	-ve (**)	-ve (**)
Employment	+ve (**)	+ve (*)
Increased energy (cheap electricity)	none	+ve (**)

- ve (**) *Negative and significant impact*
- ve (*) *Negative and insignificant impact*
- +ve (**) *Positive and significant impact*
- +ve (*) *Positive and insignificant impact*

Table E2 of the EIA report. Summary of mitigation/enhancement measures recommended by study

Area of environmental concern	Potential environmental impact	Remarks, mitigation/enhancement measures
Vegetation and biodiversity	<ul style="list-style-type: none"> • Vegetation clearance could lead to the permanent loss of vegetation especially the cycad and the riverine forests. 	The impacts are considered negative and significant. The developer should give incentives to the local people to replant the cycad around homes. Minimal clearance of the riverine forests should be exercised.
Wildlife	<ul style="list-style-type: none"> • Reduction or loss of migratory routes. 	Impacts are considered negative but insignificant. The developer in liaison with the UWA staff should determine and avoid tampering with the migratory routes as much as possible.
Landscape	<ul style="list-style-type: none"> • Quarries or borrow pits pose potential risks of movement to wildlife and humans. • Alteration of landscape due to quarries, borrow pits or stock piles of borrow materials causing a reduction in its scenic values to tourists. 	The impacts are considered negative and significant. Quarries/borrow pits should not be sited within the park, near water course or settlements. Once quarrying or borrowing is completed the sites should be immediately restored.
Hydrology, flow regime and aquatic habitat	<ul style="list-style-type: none"> • Creation of a water diversion channel to the powerhouse will lead to a reduction of water in River Mpanga section along the channel leading to changes in the flow regime and adverse impacts on the aquatic life. 	The impacts are considered negative and significant. In order to maintain the flow regime and sustain aquatic life, the developer should ensure that a mandatory discharge of about 200 litres/second from the weir (equivalent to the minimum recorded flow) is always maintained in the river and over the Falls.

Water quality	<ul style="list-style-type: none"> • Construction-related erosion and dust during project development could result in adverse impacts to the water quality of the downstream swamps. • If not managed appropriately, construction activities can result in the accidental release of hazardous waste products such as adhesives, solvents, paints, and drilling and petroleum lubricants. 	<p>The impacts are considered negative and significant. Employing industry good practice techniques. Develop emergency spillage, flood, fire and contamination control procedures. Erosion control/soil stabilization techniques such as straw mulching, erosion control blankets, erosion control matting, and hydro-seeding shall be used.</p>
Population influx	<ul style="list-style-type: none"> • The large population of migrant workers e.g. truck drivers, machine operators could lead to the spread of communicable diseases (e.g. STIs including HIV/AIDS) 	<p>The impacts are considered negative and significant. Sensitise on the dangers and precautionary measures against communicable diseases including HIV/AIDS.</p>
Problems of solid and sanitary wastes disposal	<ul style="list-style-type: none"> • Human sanitary and solid wastes will be generated and these could contaminate soil, pollute River Mpanga, attract vermins and flies causing spread of diseases 	<p>The impacts are considered significant and negative. Prepare a detailed solid and sanitary wastes management plan before the work commences.</p> <p>Build humps across the roads and post speed limits along the roads.</p>
Increased traffic	<ul style="list-style-type: none"> • Risks of road accidents to the local community 	
Loss of agricultural land	<ul style="list-style-type: none"> • Land-take for access roads, way leave for the transmission line, etc will lead to the displacement of farm land. 	<p>The impacts are considered negative and significant. Compensate lost agricultural land.</p>
Loss of community watering points	<ul style="list-style-type: none"> • The weir construction will deny the community access to the watering points for their livestock. 	<p>The impacts are considered negative and significant. Compensate lost watering points.</p>
Loss of aesthetic features of Mpanga Falls	<ul style="list-style-type: none"> • Water diversion for power generation is likely to reduce the amount of water for the spectacular Mpanga Falls hence its beauty and the potential for tourists' attraction are likely to be lost. 	<p>The impacts are considered negative and significant. To avoid losing the magnificent beauty of the Falls, the developer should employ any of these options:</p> <ul style="list-style-type: none"> - that diverted water is returned into the river before the Falls; - that the diverted water at the point the tailrace rejoins the river is pumped back into the river before the Falls; and/or - a mandatory discharge of

		about 200 litres/second from the weir equivalent to the minimum recorded flow over the Falls should be maintained.
Employment opportunities	<ul style="list-style-type: none"> • During the construction both unskilled and skilled labour will be required. Bulk of unskilled labour force is expected from within the community. 	Impacts are considered positive and significant. Majority (not less than 70%) of casual workers to be recruited from the surrounding community.
Increased energy	<ul style="list-style-type: none"> • Electricity is likely to become cheap and affordable thereby improving the standard of living and accelerating the economic development of the country. 	Impacts are considered positive and significant. Electricity coverage should be extended to areas which had no power.

ii. UWA's concerns that were expressed to NEMA about the EIA report (in verbatim)

Comments on the ENVIRONMENT IMPACT ASSESSMENT FOR THE PROPOSED MPANGA SMALL HYDROPOWER PROJECT, KAMWENGE DISTRICT

1. It is sad and disappointing that the EIA team does not seem to know that the Mpanga Falls and the surrounding area are within the boundaries of Queen Elizabeth National Park. The main Mpanga falls (photo on face page of the EIA statement) are actually within Queen Elizabeth National Park. This is neither acknowledged nor was UWA consulted.
2. The developer should include a site plan, which shows where the facilities will be located and the distances they will be away from the river. This will help to know the impacts of these facilities on the river and be able to identify the mitigation measures. The design of the entire project should ensure that the Mpanga Falls are maintained intact for Tourism purposes. Water diverted for power generation should be relayed back into the river before the main Mpanga Falls.
3. During the EIA process it is very important to consult all the stakeholders who are affected by the proposed project. However the developer consulted only the district officials and few local leaders according to the list presented on page 58. There is need to carry out more consultations especially with institutions that have a stake in the area including Directorate of Water Development, Uganda Wildlife Authority, National Forestry Authority so as to gather views and harmonise the various interests before the beginning of the project.
4. It is not mentioned how the solid waste will be managed. What will happen to plastic bottles, cans and other packaging materials? What

about the biodegradable waste from the construction camp. Since this is a fragile ecosystem good waste management measures should be put in place.

5. Proper mitigation measures for water quality should be identified. It is not enough just to say that proper mitigation measures during construction and operations should be specified in an Environment Management Plan. These should be identified by this EIA report.
6. The report mentions that in order to reduce on impact of loss of endemic plant species, the cycads, the project developer should encourage the local people around the project area to plant the cycads on farm. However this requires research to find out whether these can be domesticated and their impacts on the other domesticated plants. What will the communities benefit from planting these cycads? Are there some incentives for the local people to grow these species?
7. The riverine forest is used as local migratory routes by mammals and this project could impend their movements due to presence of people in the area. The report does not identify mitigation measures for this impact. The areas of possible migration should be left intact.
8. In order to reduce on visual impacts, the developer should ensure that materials used to construct the facilities must blend as much as possible with the surroundings.
9. It is not clear where the construction camp will be located. This should be located away from the river in order to reduce the impacts on the river and away from the park. Little clearing of the vegetation should take place in order to reduce on soil erosion.
10. Most times the communities around the projects have not benefited from the developments that have been set up in their areas. As such they have tended to sabotage the projects. How does the developer tend to benefit the communities? Given the incomes and poverty levels in the area, very few people will be able to use the electricity to light their homes as mentioned in the report.
11. Cattle from the neighbouring communities access water from the river. The project should therefore explore ways of extending water to the community for cattle access so as to limit interference with project activities.
12. Communities use the river for fishing right within the proposed site, again this must be taken into consideration.
13. UWA intends to develop the Mpanga falls site in partnership with the local communities, the Land owners and the Kamwenge District Local Government, the EIA needs to link tourism development to the proposed hydropower station.

Conclusion

The EIA was found generally lacking as explained above and UWA recommended major input from UWA, NFA, WID, CITES Management and Scientific Authorities (MTTI and MWE) for the endangered cycads, Makerere University, Mountains of the Moon University and Kamwenge Local Government and Land owners all of which should be at Senior level and, therefore, a fresh submission of the EIA statement for review.

iii. Response to the concerns and the approval

Despite several communications by UWA to NEMA raising concerns about the EIA report and the “lack of capacity and competence” of the consultant, NEMA proceeded and sanctioned the development to start. The approval was in total disregard of the technical advice by the wildlife body. Uganda Wildlife Authority (UWA) had recommended that NEMA reconsider the certificate of approval and “requested NEMA to halt the on-going works at Mpanga falls” and also recommended a fresh submission of the EIA statement for review.

7. Issues

a. Construction:

i. Road construction is crisscrossing through the landscape, particularly traversing the contour line along which the cycads are concentrated leading to reduction in population of mature and young trees and increased access by unscrupulous seed/seedling collectors. There are three camps under construction on three separate hills and the road network is constructed to connect the camps, the dam site, and the whole length of the canal (headrace channel) down to the site of the power house. This road network has caused irreparable damage to the hillsides and extreme damage to the cycad belt. In some cases it was clear that cycads were felled carelessly outside the road zone. The construction of the canal has just started and it will run parallel to the road carriage. Some roads were opened but later abandoned (Fig 5) which seems to indicate some haphazard works. The resultant effect is that cycads have been unnecessarily knocked down. However the road network was not included or at least is not mitigated in the EIA report.



Fig. 5 Abandoned road that left many cycad trees knocked down

ii. As mentioned earlier, there are three camps one located on the hill close to the dam site, another on the next hill where stones are being crashed and the other on the hill close to the water falls. The camps are located at the edge of the cycad belt and in bid to connect to one another, the large portion of the cycad belt is destroyed. The habitat quality and area of occupancy of the plants and other forms of biodiversity will be highly affected.

iii. Erosion from the construction sites and roads is evident especially on the very steep slopes as a result of the road and camps construction (Fig 6). This is likely to increase as the dam and canal construction begins. Soil erosion is likely to cause siltation of the river and the Lake George Ramsar Site, creation of deep galleys in the landscape destroying the aesthetic value of the area, secondary knocking down of more cycads and other trees, and reducing further the habitat quality of the area.



Fig. 6 Deep gully created due to soil erosion after road construction in the cycad belt

b. Damming of the river and water diversion through the canal will cause major hydrological changes in the river valley and damage to the cycad population concentrated along the survey lie of the canal (Fig 7). The canal is expected to divert over 8 cubic metres of water of the estimated 16 at high water level. Besides, the local government of Kamwenge District is constructing a water supply plant that will draw 10 cubic metres of water per day from the same river. The resultant effect may be little or no water over the falls. However no hydrological report is available

Damming of the river and water diversion may affect the following;

- i. Major hydrological changes in the river valley with possible hydrological changes on the area occupied by the cycad and other biodiversity - cycads are intolerant to flooding
- ii. The canal is expected to divert over 8 cubic metres of water of the estimated 16 at high water level. This will change the ecology of the area affecting not only waterfalls but biodiversity in the gorge including the cycads
- iii. Diversion of water and its re-introduction after the falls will lead to reduction of water over the falls, thus 'killing' the falls, scenic view and ecotourism potential.
- iv. The local and resident communities still respect the falls as a cultural sites and they are worried that the diversion of the dam may deny them access to the site but also kill the sites by diverting the water.
- v) There seems to have been little awareness raising of the communities about the activities of the developments. The communities are not aware of the restricted access to the falls and the river where the

canal will build. This may eventually result into a conflict if the local communities do not fully buy-in into the whole process.



Fig. 7 Route to be followed by the canal marked with red-painted stick

- c. Local community activities: It was evident that communities cultivating on the slopes of the gorge are clearing the cycads located on the gardens. Others are burning areas for livestock grazing and in some cases there seems to have been many trees that were carelessly cut. In some sections of the gorge, old or mature cycad trees have completely cleared. In one case large expanse of cycads were cleared because of a conflict between individuals over the land. These activities are also a big threat to the cycads.

There were reports of harvesting of cycad seeds for some individuals. This was acknowledged by community members and some of government officials in Kamwenge. This may point to some unscrupulous collectors of *Encephalartos whitelockii*. The cycad seeds of this species are already advertised on the internet and since this species is endemic to Uganda; they may be having access to the seeds of this species from the locality. The community members also acknowledged that they have “learnt” how to eat the seeds of the plant. The species is known to be poisonous and care must be taken to ensure that the community and other people are not affected.

The impact of the communities on the cycads need to be urgently addressed. The following are issues pertaining to the community activities.

- i. Clearing the plants (especially cycads) from their gardens for cultivation and grazing leading to direct reduction in area occupied by the cycads, decline in population of mature and young individuals of the plant, soil instability and erosion

- ii. There are farmers with large herds of cattle on both sides of the gorge. With increasing human population in this area, there is less land for grazing. The communities are therefore burning the steep slopes of the gorge to create more space for livestock. This practice is destroying large areas of the cycads.
- iii. Cutting/harvesting of cycads seeds for food or sale, leaves for building materials and the large stems for bee-hives (Fig 8). The communities on the northern bank are predominantly composed of an immigrant population. This has created scarcity of land and hence poses a bigger threat to the cycads through clearing the land and fragmentation than it is on the southern bank.
- iv. Collection of cycad seed/seedlings both for eating (they roast the seeds) and selling impairs the regeneration capacity of the cycad. If the collection of seed and seedlings continues unabated, it may encourage commercialization of the plant products. This will have immediate and far reaching impact on the survival of the species which is already constrained by dam construction and other threats.



Fig. 8 Stumps of cut over *Encephalartos whitelockii* trees showing the spongy stem

- v. Tourism development. As stated in Section 4 above, the tourism potential of this area is very high. This could be developed as the alternative form of environmentally friendly land use for the area. The development of the dam and its impact on the falls and cycads will greatly reduce this potential. This will be a great loss to the district and the community as an alternative income generation activity, and a loss of

opportunity for UWA to develop an ecotourism site in the eastern part of the park.

vi) Other developments

The local government is constructing a water supply plant that will draw 10 cubic metres of water per day from the same Mpanga River to supply clean water to Kamwenge town and surrounding communities. This additional abstraction of water is a Ush.2.5b project that has already commenced. This project is very relevant to the district to supply clean water to the people. The diversion of the remaining water from the river for the HEP plant will significantly reduce the volume of water left in the river and the falls especially since the water is to be re-introduced to the river after the falls.

8. Synthesis

We hereby form a strong opinion that the dam construction on Mpanga River is an actual and big threat to the survival of the endemic cycad population and the entire ecological system. This threat is compounded by existing activities from communities which also need to be urgently addressed. A combination of the HEP plant construction and community activities make the cycad population extremely threatened. It is therefore imperative that NEMA gives a wider outlook at the factors compounding the survival of cycads and other biodiversity in this area.

9. Recommendations

a) The construction of roads across the hills and multiple camps are damaging cycad contour line and destroying the landscape. The diversion of water is expected to cause serious impact on the ecology of the area and 'kill' or seriously affect the falls. The damming of water also will create a reservoir and flood some expanse of Land. These activities were not specifically considered in the EIA and therefore there are no mitigation measures proposed. This was a very serious omission by the EIA study. The result is that the developer does not have clear guidance on these environmental aspects. This is clearly demonstrated by the unnecessary opening of roads, the location of the carry road along the cycad contour Zone and in many cases the unnecessary felling of the cycad trees. Based on the above facts, NEMA should consider halting the ongoing works and carry out a fresh EIA and re-evaluate the project development. Any recommendation or approval of works in the Mpanga gorge must consider the survival of cycads and preservation of the landscape as a national heritage.

b) The cycads are an ancient plant believed to have survived over 200-300 million years. We may consider this plant probably the only Uganda's surviving "dinosaur". It is not known anywhere else in Uganda and not anywhere else in the whole world. It is thought to be the largest forest of any cycad in the world. This is a blessing to Uganda that such a treasure is still located within our borders. This plant is described as critically endangered according to IUCN with a very small area of occupancy less than 1sq km. In order to conserve the species and the ecological integrity of the gorge, we strongly recommend that this area be accorded a conservation status. The

best option would be to extend the boundaries of QENP to cover the critical area for the cycads.

c) The community activities are also a big threat to the cycads. There is need for urgent community sensitization about the importance and conservation significance of the gorge and endemic cycad plants.

d) The ecology as well as the economic uses of cycads is not well known. There are reported harvesting of the different parts of the plant for building houses, for eating and sale. It is likely that the plant could be propagated by the communities at even commercial scale. However little information is available about the plant. A comprehensive study of the biology and ecology of *Encephalartos whitelockii* should be carried out to guide conservation and sustainable utilization of the plant.

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