Building ecological resilience in a rapidly changing landscape

<u>Introduction</u>

This paper addresses the issue of quantifying and managing potential impacts from project activities in a landscape where habitat loss through anthropogenic means is rapid and uncontrolled. We consider data collection and sharing techniques to allow collaboration between environment, engineering and project teams. This paper discusses our approach to the design of ecological resilience in to a projects mitigation strategy focussing on examples of critical and natural habitat in Tanzania.

<u>Background</u>

The East African Crude Oil Pipeline (EACOP) Project is a crude oil export pipeline that originates in the Kabaale Pump Station and ends at a marine storage terminal (MST) at the Chongoleani peninsula in Tanga district. From the MST, the oil will be transported via a trestle to a loading platform and then loaded on to tankers,

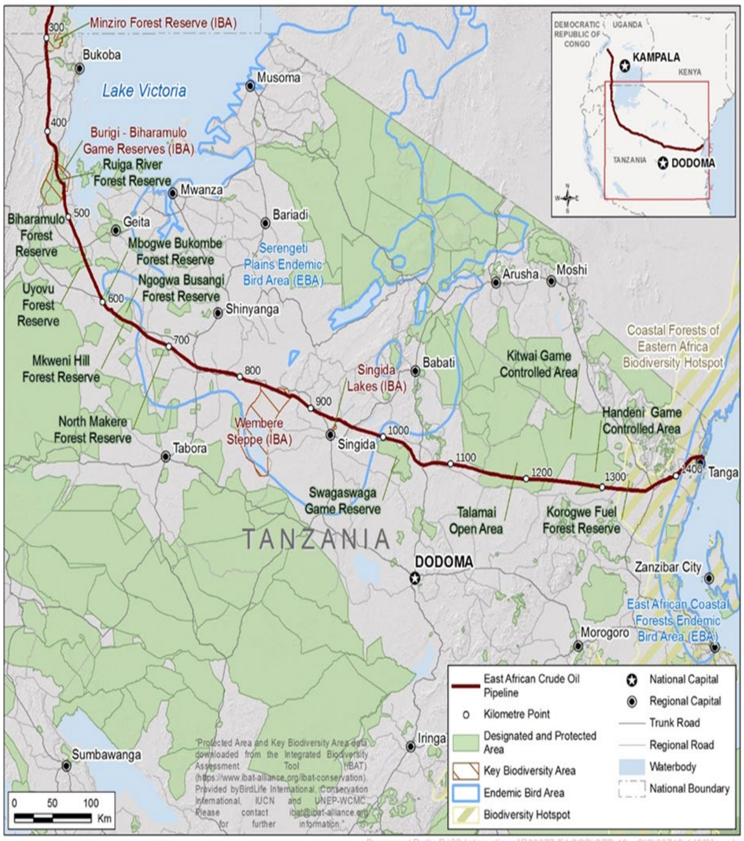
The EACOP Pipeline itself is a 1443 km long, carbon steel pipeline of 24” outside diameter, with the capacity to deliver up to 246,000 barrels per day (bpd). The pipeline will be buried and thermally insulated with polyurethane foam.

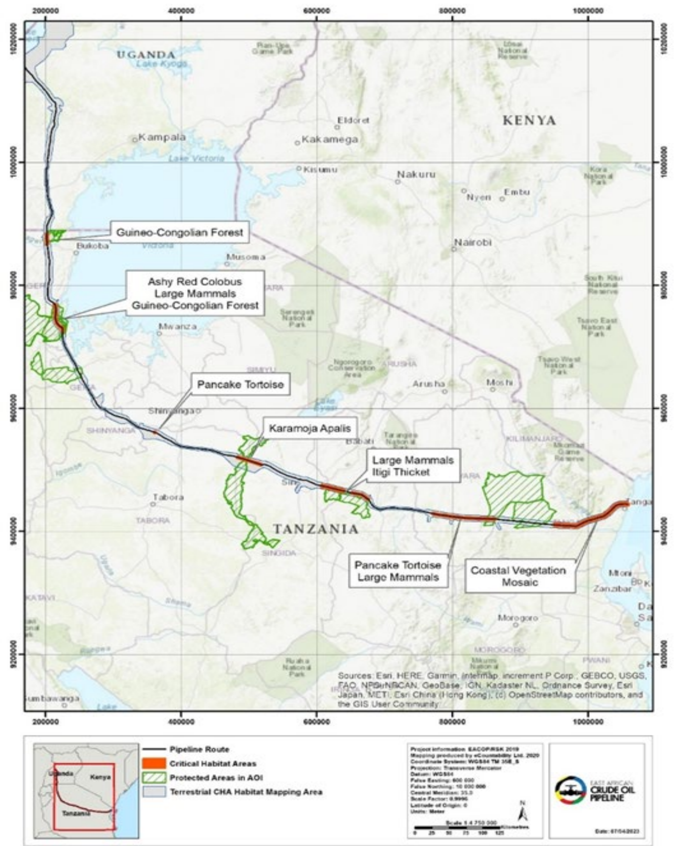
The Environmental and Social Impact Assessment (ESIA) and associated Critical Habitat Assessment (CHA) was developed in 2018. An addendum document was developed in 2019 to address changes in the CHA guidance as per the updated IFC PS6 Guidance Note and based on this Biodiversity Action Plans (BAP) and Biodiversity Offsetting Management Plans (BOMP) were developed for the project to set out how the project would deliver no net loss for natural habitat and a net gain in critical habitat. The development of the BAP / BOMP required consideration of the ecological resilience of the landscape and innovative approaches to data sharing as detailed within this paper.

<u>Ecological baseline, status and threats</u>

The route passes through a mosaic of natural and modified habitat with some areas highlighted as highly threatened or unique and therefore qualifying for critical habitat. The Ugandan section comprises mainly undulating terrain with cropland and settlements. Large wetlands are located along the Lake Victoria shores. In Tanzania the land becomes more sparsely populated with a mosaic of cropland and dry grazing lands. Figures 1 illustrate the route and interaction with protected and legally recognised areas, natural and critical ecosystems.

Figure 1: Protected Area	*Figure 2: Tanzania – Critical Habitat Areas*





Existing threats in the landscape

Tanzania like many other African countries is experiencing rapid biodiversity loss. The main threat to biodiversity is habitat loss and conversion to other land uses such as settlements, agriculture and grazing. Other threats include overexploitation, introduction of invasive species, pollution and climate change.

Tanzania is facing unprecedented loss of its forests and other woodlands. Between 1990 and 2010, the country lost an average of 403,350 ha or 0.97% per year (Kideghesho 2015). Between 1990 and 2010, the total loss was estimated to be 19.4% (about 8,067,000 ha) of the forest cover. In this period, Tanzania was, among the ten countries that had the largest annual net loss of forest area. The country's entire forests could be depleted within the next 50 to 80 years if the current trend remains unabated.

Population growth increases the demand for food, settlements, infrastructure development, fuelwood, furniture, building materials and other products. Deforestation is inevitable if the country is going to meet these demands. The impact of population growth on deforestation is worsened by poverty where much of the population have limited livelihood strategies and, therefore, compelled to pursue unsustainable economic options including deforestation.

Charcoal burning and agriculture are considered the most significant threats to forests with agriculture accounting for about 80% of total deforestation in poor countries. Subsistence agriculture is responsible for 48% of deforestation while commercial agriculture contributes 32% (IUCN ESARO 2020).

The inability to afford agricultural inputs results in people being forced to abandon farms and clear new areas, a system known as shifting cultivation. Virgin forest soils are easy to work and are more fertile with a lower weed burden for the first two years. After about two or three years a new area of land is cleared leading to rapid deforestation (IUCN ESARO 2020).

Rapidly growing populations and urbanisation results in high demand for fuelwood, especially charcoal (Msuya et. al. 2012) estimated the amount of charcoal consumed in Dar es Salaam to be 1904 tonnes per day or 694,960 tonnes per year. The analysis indicated further that charcoal consumption in Dar es Salaam in 2009 alone caused a loss of about 105,300 ha of forests.

Understanding and managing changes in the landscape

One of the key challenges for the project was to understand and quantify project related impacts in light of the observed changes to the landscape outside of the project control. This quantification is needed to allow the development of robust mitigation and management planning but also to look at holistic approaches to the wider issues. It could be argued that the already rapid rate of decline of forest habitat will be increased by induced access and in-migration from the project (and other infrastructure projects.) Or looking more widely that the economic growth in part delivered by the oil industry will lead to increased industrial activity and therefore urbanisation and the problems that accompany it. To what extent do internationally funded projects such as this take responsibility for the wave of change and how can projects work together and with conservation bodies to manage the change?

Our first step along this journey was to understand and quantify habitats along the route and where the project would impact natural and critical habitat.

As part of the development of the BAP an updated habitat mapping exercise was undertaken. The objectives of this exercise were to:

- Expand the mapping area beyond the 2km corridor used for the ESIA and to align with changes to IFC PS6 guidance
- Update the mapping from the 2017 ESIA, using up to date imagery to understand the changes in the landscape since the biodiversity baseline was undertaken approximately 4 years previously
- Improve the resolution and detail of mapping to help better define areas of critical habitat for species based on habitat use.

Habitat mapping for the project was updated and extended to improve the spatial and temporal extent of mapping, significantly broadening the coverage from the ESIA mapping. The spatial scope was extended using a minimum 5km corridor which was broadened to 10km in areas of known sensitivities or protection. The final mapping AOI equated to approx. 19,500km2.

In order to obtain satellite imagery to cover this AOI extent a high resolution satellite source was selected, which comprised SPOT 6/7 1.5m resolution imagery, with the various scenes acquisition dates acquired in 2020 and 2021. Supervised imagery classification was used to develop initial mapping layers for ground truthing.

The habitat mapping was subsequently ground truthed in the field by a team of local botanist. The teams used tablet computers populated with mapping data to survey areas and verify mapping details. Data on habitat condition and existing threats was collected for each habitat patch which could latterly be used in biodiversity accounting calculations. The ground truth surveys provided additional information on the change in habitat extent from the date of the aerial imagery to the survey date which allowed a more robust assessment of type and amount of habitat affected by the project. Field data was used to update and verify the satellite based mapping.

Mapping data were also used to target species surveys at core habitat. Surveys were focussed on areas of critical habitat where impacts were likely and therefore detailed mitigation and offsets needed to be considered. The field surveys provided additional information on core and periphery habitat, population estimates (where possible) and areas of suitability for biodiversity offsetting.

In addition to this, further mapping has been completed to try to visualise and quantify historic changes to core habitats, looking at changes in forested reserves and in the wider landscape, to understand rates of forest habitat loss and to develop estimates for future loss.

Landsat satellite imagery (30m) from archive (2000) was used to inform a habitat change assessment. In addition to the Landsat imagery and mapping, Global Forest Watch datasets were analysed, including tree cover data for 2000, as well as tree cover loss on a yearly basis between 2001 and 2021. For example in Talamai OA, over the last two decades the average yearly tree cover loss was around 977 ha as illustrated in Figure 3

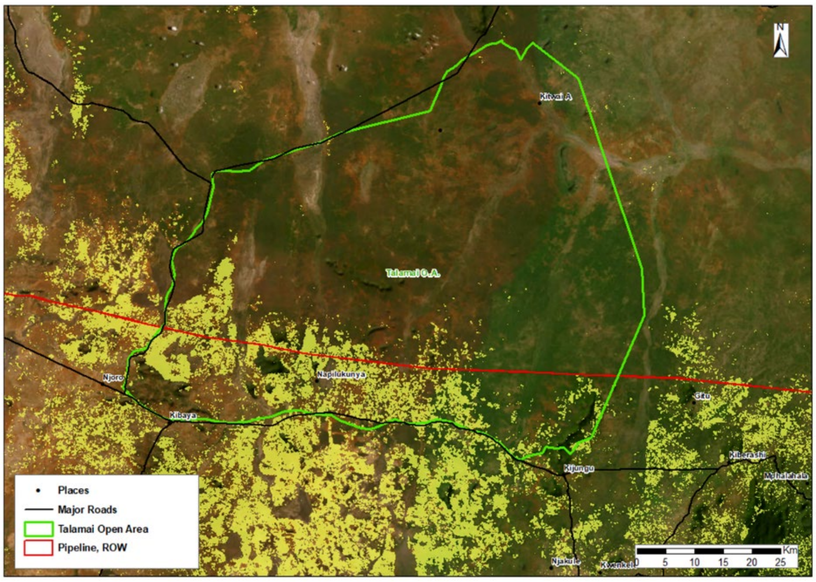


Figure 3 Global Forest Watch (GFW) – Total Tree Cover Loss 2001 - 2021

The importance of avoidance in the mitigation hierarchy cannot be underestimated and the Project took great lengths to consider all possible options for avoidance. The updated habitat mapping, supplemented with the additional field surveys and ground-truthing, was used to support the application of the mitigation hierarchy including a detailed and thorough avoidance and minimisation review, undertaken with the project Engineering Team.

A detailed route review was undertaken for the entire route length, highlighting every area of natural and critical habitat along the route. This process involved documenting the pipeline sections that directly affected critical habitat and sharing this data with engineers with a wish list of mitigation from re-routes to width reductions. The engineers used their design criteria to establish whether a reroute was technically feasible. Significant effort was also made to reduce the ROW footprint from 30m to 25m where possible. In total for Tanzania 983 ROW reductions were agreed, reducing the ROW footprint by approx. 385,000 m2. These avoidance scenarios resulted in overall reduction in loss of critical and natural habitat from 1040 ha to 921.96 ha.

For natural and critical habitats requiring no net loss / net gain the data on anthropogenic threats gathered through ground truthing was used to look at wider issues in the landscape and how they could be managed through offsets and additional conservation action. A common criticism of biodiversity offsets is the lack of management control after the lifetime of the project. External pressures on the land often mean an offset can fail. Ecologically resilient offsets are those that have a good understanding of these threats and have built these into offset design. For example, a critical habitat feature identified through the project is the Karamoja apalis which relies on whistling thorn *Vachellia drepanolobium* habitat. This habitat is prized as good firewood and for the resin it produces that can be used as glue. It is a hard wood and can also be used for fencing and tools. It is responds well to coppicing so can be a sustainable source of wood if managed correctly. Local communities therefore have an interest in preserving whistling thorn habitat so resilient offsets can be developed through community engagement. The EACOP Project is currently undertaking community meetings to look at establishing Village Land Forest Reserves with an objective of sustainable forest management. This is just one example of a livelihoods based approach to biodiversity conservation that the project is initiating to deliver its requirements to PS6.

Conclusions

Where habitat loss and degradation is happening at such a rapid rate development projects have a responsibility to implement effective avoidance measures to protect remnant patches. As well as the avoidance of impacts actions in the landscape should be cognisant of these changes, what are the drivers and what can be done to build resilient mitigation and compensation measures. Strategic thinking with local communities and authorities to look at holistic approaches that benefit people and biodiversity. Habitat restoration must consider sustainable land use options and safeguarding through community projects or other mechanisms.

References

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