ICOMOS/IUCN Advisory Mission to Ngorongoro Conservation Area

(United Republic of Tanzania)

23rd to 26th August 2017

Table of Contents

List of Tables and Figures

Acknowledgements

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Abbreviations and Acronyms

CHIA	Cultural and Heritage Impact Assessment
ESIA	Environmental and Social Impact Assessment
GMP	General Management Plan
HIA	Heritage Impact Assessment
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICOMOS	International Council on Monuments and Sites
IUCN	International Union for Conservation of Nature
NCA	Ngorongoro Conservation Area
NCAA	Ngorongoro Conservation Area Authority
OUV	Outstanding Universal Value
SENAPA	Serengeti National Park
SP	State Party
TANAPA	Tanzania National Parks Authority
TANROADS	Tanzania National Roads Agency
TATO	Tanzanian Association of Tourist Operators
TLC	Traffic Load Class
TOR	Terms of Reference
UNESCO	United Nations Educational, Scientific and Cultural Organisation

Executive Summary and List of Recommendations

A joint IUCN/ICOMOS Advisory Mission visited Ngorongoro Conservation Area (NCA) from 23rd to 26th August 2017 to examine progress with plans for re-surfacing the main (T17 trunk) road through the property, and advise on requirements for protection of the property's Outstanding Universal Value (OUV). The Ngorongoro Conservation Area Authority (NCAA) contracted a consulting engineer in December 2013 to undertake an initial feasibility study (which was completed in June 2015), followed by detailed design plans, Environmental and Social Impact Assessment (ESIA) and Heritage Impact Assessment (HIA).

The mission reviewed these documents and travelled the full (83km) length of the road, examining its present condition and particular points of environmental, archaeological and engineering interest including Olduvai Gorge, borrow pits (active and disused), drainage lines, and the recently-resurfaced crater ascent road. The team met with a wide range of stakeholders including representatives of NCAA, Tanzania National Parks (TANAPA) the Ngorongoro Pastoral Council, Tanzania Association of Tour Operators (TATO) and the project consulting engineers.

The team concluded that:

- The present murram/gravel road is heavily used by a rapidly growing number of tourist service vehicles, local residents and (a limited amount of) through traffic. It requires considerable continuous maintenance resulting in significant environmental impacts affecting the property's OUV, with high financial costs (for road maintenance operations and vehicle repair) and a compromised visitor experience;
- The proposed road hardening project has the potential to reduce maintenance costs, improve visitor experience and local livelihoods, and (to some extent) contribute to the restoration of the property's OUV currently impacted by the condition of the existing road;
- The main risk associated with the project is that it could result in a significant increase in the volume of through traffic and visitor numbers beyond the agreed carrying capacity, especially if the development of proposed alternative routes linking the lake shore regions with the rest of Tanzania are not undertaken or delayed and this might lead to adverse impact on OUV if traffic is not adequately managed;
- In addition, there are significant risks of environmental damage during the construction phase affecting the property's OUV, but all of these can be satisfactorily mitigated. The impacts will be highly localized and no significant direct impacts are anticipated at the paleontological sites of Olduvai Gorge and Laetoli Footprints, nor within the ecologically-sensitive Ngorongoro Crater;
- From an engineering perspective the decision-making criteria and process underlying design decisions are not clearly articulated and the mission is concerned at the possibility that some of the selected engineering solutions are excessively demanding on construction materials (especially gravel and water), most of which will be sourced within the NCA with correspondingly high environmental impacts. It would be preferable to proceed cautiously with implementation, perhaps undertaking a small section in the highest priority area to the preferred design standards so that adjustments can be made before committing to construction of the entire 83km of road.

In view of the above, the mission recommends:

R1. The road hardening project can be implemented, subject to provisions detailed in the ESIA and HIA, including the necessary mitigation measures (see also R2) and by applying a phased approach (see also R7) to enable adjustments to be made, as required, as project implementation progresses, in order to mitigate potential impacts on the natural and cultural heritage values of the property. Before finalizing the planning phase of the project, NCAA and its Consultants should review the proposed detailed design and the mitigation measures in the ESIA, CHIA and the recommendations in this report, and modify details as necessary to conform to World Heritage requirements.

R2. The mitigation measures should include a specific action plan to ensure traffic through the property does not increase as a result of upgrading the road. This action plan should be submitted to the World Heritage Centre and the Advisory Bodies for review, and be updated periodically by NCAA based on the evolution of the traffic demand. The road should be formally classified as a park road (instead of a trunk road) and be placed fully under the jurisdiction of NCAA. This will guarantee that NCAA can implement the necessary measures to regulate the traffic which are part of the above mentioned plan and maintain measures presently in place to limit the opening hours and type of vehicles allowed as well as restricting through traffic. Present monitoring of through traffic should be continued and fee schedules adjusted to further discourage through traffic and heavy commercial vehicles as necessary. An increase in fees for these classes of road user may be required to counter the attraction of using the improved road after resurfacing.

R3. Urgently seek finalization of the feasibility study for the southern by-pass route(s) to the lake shore regions, and promote its adoption as part of a strategic national and regional transport plan, and its implementation;

R4. Prior to completion of tender documents for the road hardening project, NCAA should develop suitable environmental and archaeological management standards, over and above statutory requirements, based on a thorough review of the recommendations of the ESIA, HIA and this mission. In further compliance with Paragraph 172 of the *Operational Guidelines* these management standards should be submitted to the World Heritage Centre in draft form so that they can be reviewed and (if necessary) revised before they are included as a tender requirement. These may include topics such as the acceptable limits of damage to roadside vegetation during construction and the procedures to be followed in preparing and rehabilitating borrow pit sites (including, for example, the temporary storage of topsoil), water courses and other areas impacted by the project. The aim of establishing such standards should be to ensure that ecological restoration can be achieved as fast and fully as possible following completion of the project. The proposed tender documents and form of contract should be reviewed and if necessary revised to ensure full compliance with these environmental management standards during project implementation including provisions for monitoring and enforcement.

R5. NCAA should ensure that it has the technical and human resource capacity to monitor and enforce the required standards of environmental and archaeological management during all stages of the project, and if necessary develop this capacity before the start of the project.

R6. Prior to commencement of the construction phase, areas that will be subject to direct project-related impacts (such as water sources, downstream wetlands, quarries, borrow pits, road camps)

should be subject to baseline vegetation and archaeological surveys to ensure that they are not of special significance, while also allowing for rapid, complete restoration at de-commissioning;

(i) Archaeological investigations must be carried out as a priority as substantive findings will affect the viability of the proposed design solution.
(ii) Ecological and environmental baseline surveys need to be commenced now in order that seasonal variations can be recorded. These surveys will include, amongst others, species inventories and measures of relative abundance, basic vegetation mapping and fixed point photographic reference.
(iii) Surveys should be carried out along the length of the road to record the baseline in terms of ecology, location of vegetation with respect to the existing verges, state of soil erosion due to surface water run-off, presence of exotic species, etc.

R7. A phased approach should be adopted, allowing for adaptation of design standards and implementation procedures as practical experience of construction outcomes, material sourcing constraints and environmental concerns is gained. This is especially important in view of the fact that NCAA's preferred surfacing option (200mm thick solid concrete pavement) will require very large quantities of materials, with correspondingly heavy localized environmental impacts at quarries, borrow pits, water sources and downstream wetlands. NCAA might consider Phase 1 of the project to be the most heavily used section of road from Lodoare Gate to NCCA HQ or Seneto Junction (+0.000 to +15.000 or +29.000), with subsequent phases taken as +29.000 to the base of the hill at approx. +43.000, then +43.000 to Golini Main Gate. As part of the phased approach NCAA should:

(i) Reconsider the possible use of asphalt concrete (including the addition of colour) for the sections of road subjected to lower traffic pressure, on the grounds that it could significantly reduce the quantity of materials required and the associated environmental damage.
(ii) Consider the use of geocell in conjunction with asphalt concrete and concrete surfacing, to reinforce the road base / sub-base, enable lower quality fill material to be used from existing borrow pits and reduce the overall material demand from within NCA (subject to design).
(iii) Consider the Olduvai Museum road separately to the remainder of the road from a design and implementation point of view, just as the Crater ascent and descent roads are not included in the surface hardening project. A similar 'softer' approach to surface hardening could be used for the 5km road to the museum, reflecting the lower traffic volumes. 'Softer' approaches could include the use of interlocking paving blocks or geocell membranes to reinforce a gravel road (subject to design).
(iv) Recognising the general requirement to avoid importation of gravel materials from outside the NCA, consider whether it may be preferable to permit such importation for a specific project such as this, in controlled circumstances, rather than depletion of resources (gravel and water) from within NCA. Careful management of the excavation and importation of gravels from outside NCA could include removal of top soil and associated seeds / vegetation prior to quarrying thereby reducing the risk of importation of exotic species. Storage of the imported stone / gravel away from other native vegetation will also help the identification and removal of imported species. Such an approach could be preferable in light of the quantity of materials needs for the surface hardening project.

R8. As an interim measure prior to surface hardening NCAA should review the method of maintenance of the existing unpaved road, particularly in the section across the plains from +43.000 to Golini Gate. The review should include options such as enforcement of the speed limit of 50 km/h to reduce degradation, inclusion of geocell reinforcement to increase longevity of the gravel surface and management of the (unsightly) waste material at the road-side, not used within the surfacing.

1 BACKGROUND TO THE MISSION

1.1 World Heritage Values and State of Conservation

Ngorongoro Conservation Area (NCA) was one of the first natural sites to be inscribed on the World Heritage list, in 1979. It was inscribed under all four natural criteria, recognizing the Outstanding Universal Value (OUV) of the mass migration of wildebeest and other large herbivores through the area (as part of the wider Serengeti ecosystem), the exceptional beauty of the area's natural landscapes; the exceptional geological features; the complexity of ongoing ecological processes and the diversity of its mammalian fauna, including many rare and endangered species. The property was inscribed under cultural criterion (iv) in 2010, recognizing its importance in providing crucial evidence in the story of human evolution over four million years. In particular, extensive archaeological research for over 80 years has yielded a long sequence of evidence of human evolution and human environment dynamics, collectively extending over a span of almost four million years to the early modern era. This evidence includes fossilised footprints at Laetoli, associated with the development of human bipedalism, a sequence of diverse, evolving hominin species within Olduvai Gorge, an early form of Homo sapiens at Lake Ndutu; and, in the Ngorongoro Crater, remains that document the development of stone technology and the transition to the use of iron.

It was noted at this time that the overall landscape of the area is seen to have the potential to reveal much more evidence concerning the rise of anatomically modern humans, modern behaviour and human ecology, but was lacking in detailed maps and documentation. The Committee requested the State Party to submit details on the specific area and location of the palaeo-anthropological resources, including specific boundaries for Laetoli, Lake Ndutu, Nasera, and the Ngorongoro Burial Mounds, and for their sensitive settings, to ensure their protection; details of sensitive archaeological landscape throughout the property, and details of the location of finds from all paleoanthropological sites. None of these have so far been submitted.

The property supports a growing resident population including Maasai pastoralists who maintain a substantial herd of domestic animals alongside the area's naturally-occurring wild animals. The Maasai maintain a largely traditional lifestyle and benefit from tourism in a number of ways.

1.2 Background to the proposed road surfacing project

1.2.1 Needs identification and origins

The main road through the centre of Ngorongoro Conservation Area (NCA) from Lodoare Gate in the south to Golini (at the northern boundary with Serengeti National Park (SENAPA)) is an 83km stretch of unpaved murram/gravel road which provides access to the area for an increasing number of tourist service vehicles while also serving as a regional link between the northern town of Arusha and Mara Region on Lake Victoria's eastern shore. Between 2000 and 2013 the number of vehicles using this road increased at an annual average rate of 10.2% from 36,581 to 129,968 (Table 1). The present level of traffic now exceeds the maximum that can be sustained by such an unpaved road (estimated to be about 500 vehicles per day) and its maintenance comes at a very high financial and environmental cost.

The road (including the adjoining section through SENAPA) is classified as a national (trunk) road, but control over its use and maintenance has been devolved by the national roads agency (TANROADS)

to the Ngorongoro Conservation Area Authority (NCAA). Accordingly, NCAA levies fees on all road users on a 'per-vehicle-plus-per-occupant' basis for each 24-hour period. Fee structures are designed to maximize revenue from foreign visitors, serve as a deterrent to through-traffic and allow concessionary access to members of resident pastoralist communities (see Annex 1 for fee structures).

Fig.1. *Traffic has increased substantially in recent years. Safari vehicles at the Lodoare Gate entrance to Ngorongoro Conservation Area (left); Supply vehicles on the road below the crater rim, in the morning mist (right). ©IUCN/Peter Howard.*

By about 2012 it became clear that hardening of the road surface was becoming an increasingly urgent management priority, as a means of reducing the current cost of road maintenance on NCAA, improving the visitor experience, and reducing the environmental damage caused by the quarrying and extraction of road materials within NCA. Accordingly a consulting engineer (Gauff Inginieure/UCB) was contracted in December 2013 to undertake an initial feasibility study, followed by a detailed engineering design, full Environmental and Social Impact Assessment (ESIA) (including a Cultural and Heritage Impact Assessment, CHIA), detailed cost estimates and tender documents amongst others. The feasibility study and preliminary engineering design was completed in June 2015, and a final ESIA (with CHIA) in August 2016. At the time of the mission a draft final engineering design for the preferred option (a 200mm-thick rigid concrete pavement of 7m width), together with draft financial plan and tender documents had been submitted to NCAA.

Table 1. *Indicators of growth in the demands on the road from 2000 to 2013 (compiled from GI/UCB Project Brief, April 2017).*

Year	Total Vehicles	Number of Visitors (000s)			NCAA Road Maintenance Cost (US$m)	Total NCAA Revenue (US$m)
		Non-Resident	Resident	TOTAL		
2000	36,581	n/a	n/a	n/a	n/a	n/a
2005	68,404	238	98	336	n/a	13.9
2009	85,398	240	201	441	3.6	25.3
2013	129,968	350	296	646	1.4	38.4

1.2.2 Regional context and transport planning in northern Tanzania

One of the stated objectives of the proposed road hardening project is to improve 'the existing poor link between Arusha and the Lake Zone Regions' (Project Brief, February 2017). As noted above the

road is a national trunk road (T17) and by far the shortest route between the rapidly developing centres of Arusha and Musoma (on Lake Victoria's eastern shore). There is therefore a significant risk that the project will result in increased through traffic with all the associated environmental costs. The project needs to be considered within the broader context of national transport planning and the prospects for an alternative route linking Musoma and the Lake shore regions with the coastal ports and other parts of Tanzania. Three alternative routes are currently under discussion, but none of them are operational. The first and most controversial of these would be a route through the northern part of Serengeti National Park (between Klein's Gate and Tabora B, red route in Fig.2 below). This option was subject to a lot of controversy and at the 35th session of the World Heritage Committee (UNESCO, 2011), Tanzania agreed to reconsider the North Road and to maintain the stretch of 53 km from Kleins Gate to Tabora B traversing the northern wilderness area of the property as a gravel road under the management of the Tanzania National Parks (TANAPA) and reserved for tourism and administrative purposes.

The second alternative route would be a southern bypass from Karatu along the southern shore of Lake Eyasi (shown in blue, Fig.2), and thirdly, a longer southern bypass (green, Mbulu route, Fig.2). These southern routes are currently the subject of a feasibility study.

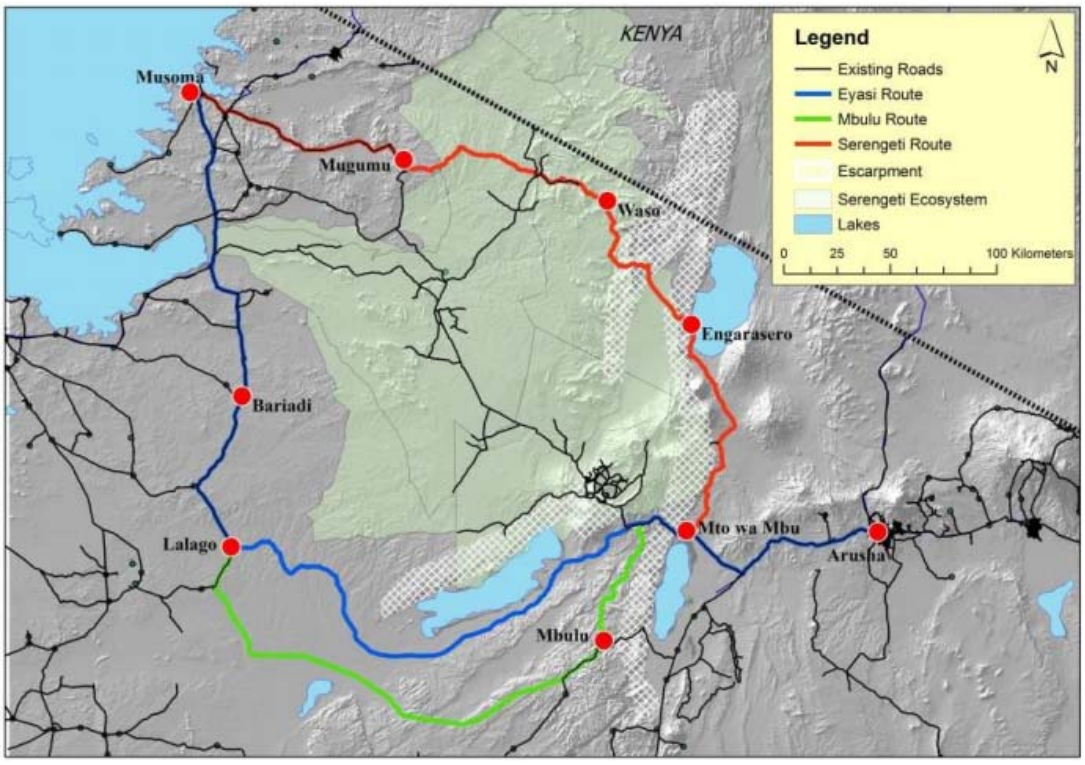


Fig.2. *Road options around the Serengeti ecosystem (source: Hopcraft et al., 2015[1]).*

1.2.3 Existing road condition and maintenance requirements

As noted above the existing main road through Ngorongoro is a murram/gravel road maintained by NCAA. It has a nominal width of 7m, but in practice its 'footprint' includes an equivalent width on each verge, where waste material, drainage ditches, erosion and vegetation cloaked in road dust are

[1]Hopcraft, J. G. C., Mduma, S. A. R., Borner, M., Bigurube, G., Kijazi, A., Haydon, D. T., Wakilema, W., Rentsch, D., Sinclair, A.R.E., Dobson, A. and Lembeli, J. D. (2015), Conservation and economic benefits of a road around the Serengeti. Conservation Biology, 29: 932–936. doi:10.1111/cobi.12470.

significant local impacts. Maintenance of this road is expensive: the NCAA spent the equivalent of between US$1.4 m and US$3.6 m annually on road maintenance over the period 2009-2013, funds that might otherwise have been used on other urgent protection and conservation works. In addition to the financial burden of road maintenance, NCAA suffers a chronic shortage of suitable construction materials for maintenance. Materials from within the NCA are preferred as this prevents the inadvertent importation (and subsequent spread) of invasive alien plants. However the suitability and quality of materials available within the NCA is low, so substandard materials are used, maintenance has to be carried out more frequently than should be necessary, and the large quantity of material required creates excessively large borrow pits and associated environmental impacts.

Fig. 3. *Existing road conditions. Roadside vegetation is cloaked in a heavy coat of unsightly dust (left); the width of the road crossing the plains near Golini is considerably greater than the carriageway itself due to waste material piled along the road verges (right). ©IUCN/Peter Howard.*

1.2.4 Recent experience of resurfacing the crater ascent road

The 5km-long 'crater ascent road' is a steep one-way road which is used by about 300 tourist vehicles daily. Over a period of about three years (2009-12) this road was resurfaced using interlocking concrete paving blocks, providing valuable experience of road hardening within the NCA and serving as a useful 'pilot project'. The outcome is considered highly successful. The road has required no maintenance over its first five years of service, whilst providing a comfortable ride for visitors at the end of a long day, and has blended well into the landscape as natural vegetation has become re-established right up to the road edge and the textured concrete surface has trapped soil and 'weathered in'. The 'footprint' of this road is significantly smaller than it would have been prior to its re-surfacing.

Fig. 4. *The crater ascent road was re-surfaced about five years ago with interlocking concrete blocks. This has been highly successful and reduced the width of the road 'footprint' considerably as vegetation is established right up to the kerb. ©IUCN/Peter Howard.*

1.3 Examination of the road re-surfacing issue by the World Heritage Committee

At its 36th session (2012) the World Heritage Committee (WHC) urged the State Party (SP) to implement the recommendations of the 2012 Reactive Monitoring mission which included, *inter alia*, a recommendation to develop a clear road strategy for the Serengeti ecosystem as a whole (in collaboration with TANAPA) and submit draft technical and regulatory documents (including ESIAs and HIAs) to the World Heritage Centre for review by the Advisory Bodies (so that any recommended changes can be incorporated before plans are finalized). Subsequently, following completion of the feasibility study and ESIA, a team from NCAA (including members of the consulting engineers) travelled to Paris in February 2017 to present their findings and report on progress. Following this meeting, the Committee, at its 41st session (Krakow, 2017) commended the SP for its efforts to regulate the passage of heavy commercial vehicles and welcomed the steps accomplished so far towards hardening of the road. It requested the SP to invite a World Heritage Centre/ICOMOS/ICCROM/IUCN Reactive Monitoring Mission to the property to examine and advise on developments, including the road upgrade project.

1.4 Justification for the mission (TORs, itinerary, mission team)

Recognising the urgency to make progress with the road re-surfacing project, and the difficulty of organising a full mission at short notice, it was decided to focus an Advisory Mission on the road issue, specifically to:

- Hold consultations with stakeholders;
- Assess the overall strategy and progress with the road hardening project;
- Advise on measuring and mitigating any impacts on the Outstanding Universal Value (OUV) of the property.

The full Terms of Reference (TORs) for the mission are included in Annex 2.

The mission took place from 23rd to 26th August 2017, and involved two external experts from IUCN and ICOMOS. Caroline Ray (representing ICOMOS) is a civil engineer with 26 years' work experience leading multi-disciplinary teams on projects across three continents, while Dr Peter Howard (representing IUCN) is a wildlife/protected areas specialist and ecological economist with 37 years' experience in African wildlife conservation.

Over the course of four days the mission consulted with officials of the NCAA, TANAPA, the Tanzania Association of Tour Operators (TATO), Ngorongoro Pastoralist Council, Gauff Ingenieure consultants and other stakeholders (a full list is provided in Annex 4). The mission also travelled the full 83km length of the road to better understand the need for resurfacing and the road's impact on the property's OUV, as well as the likely impacts of the project during the implementation period and after completion. The site visit included inspection of specific target locations including Olduvai Gorge; an active 'borrow pit', as well as an exhausted one that has been (partially) restored; and locations where special engineering requirements will be necessary such as bridges, culverts and drainage channels. Finally a short visit was made into the Ngorongoro Crater, affording an opportunity to travel the full length of the hardened 5km 'crater ascent road'. The mission itinerary is provided in Annex 3.

2 IDENTIFICATION AND ASSESSMENT OF ISSUES

2.1 Expected benefits of road re-surfacing

The mission considers the following to be the primary benefits of the proposed road resurfacing project.

2.1.1 Improved visitor experience

A paved road is expected to provide a much more comfortable and enjoyable ride for visitors. This is especially important for the type of visitors who can afford the relatively high costs involved in visiting Ngorongoro, as they are often older, retired people. Long sections of the existing gravel road are prone to development of corrugations which make for a very bumpy ride (at required 50 km/h speeds) and/or encourage dangerous over-speeding (to provide a smoother ride). Dust is a major problem under existing conditions, with great plumes of it lifted by each passing vehicle. This not only impacts personal cleanliness and comfort, but creates hazardous driving conditions through reduced visibility and smothers roadside vegetation in an unsightly cloak of discolouring dust (at least during the dry season). Furthermore, the landscape views enjoyed during a journey through Ngorongoro are negatively impacted by present road maintenance procedures which create a 'landscape scar' which is at least three times the width of the 7m-wide driving surface because of drainage channels, erosion and wide ridges of oversized rocks that have been pushed to either side of the road. If properly managed these roadside accumulations of waste material could be incorporated into the road substrate during the road hardening work, so the total width of a surfaced roadway (and its visual/landscape impact) could be reduced by half. The re-surfacing project could thereby provide an enhanced 'wilderness travel experience' for visitors, with road verges properly contoured and vegetated to merge naturally into the wider landscape. Visitors could then enjoy the natural landscape vistas and wildlife viewing during a smooth ride through some of Africa's most stunning scenery, instead of hanging on to their seats through the dust of passing vehicles, longing to get to their destination.

Fig.5. *The experience of visitors travelling the present dirt road is characterized by an abundance of dust, discomfort and unsightly road verges piled with waste rock and scarred with erosion gulleys. ©IUCN/Peter Howard.*

2.1.2 Increased visitor capacity and revenues

A surfaced road will improve accessibility and reduce travel times so that visitors can make shorter visits, as part of a wider and more diverse tour itinerary. As a result it might be possible to accommodate additional visitors without overcrowding, and increase revenues correspondingly but numbers should not exceed the agreed carrying capacity resulting from the 2016 tourism assessment. In addition, the paved road will facilitate access to parts of the conservation area that are currently under-utilised, thus dispersing visitor pressure across a wider area and diversity of attractions.

2.1.3 Improved management through cost savings on road maintenance

As noted above (Table 1 and Section 1.2.3) NCAA spends a considerable amount of its scarce resources on road maintenance, the majority of which goes on the main (project) road. If these funds can be saved, they can be re-allocated to other aspects of protection and management within the area, with more direct conservation benefits.

2.1.4 Reduced vehicle maintenance costs

The present condition of the road results in high vehicle maintenance costs for all road users, and is of particular concern to tour operators and NCAA. In some cases, major tour operators consider it necessary to maintain 'standby vehicles' because of the high incidence of breakdowns. A surfaced road is expected to contribute to reduced vehicle maintenance costs and corresponding increase in operational efficiency for the tourism sector and NCAA management.

Fig.6. *Existing road conditions cause frequent breakdowns, roadside tyre changes and high vehicle maintenance costs. ©IUCN/Peter Howard.*

2.1.5 Development benefits for pastoral communities

The communities living within the conservation area will benefit from improved access to goods and services. It is also anticipated that NCAA road maintenance capacity will be re-deployed after completion of the road re-surfacing to improve other internal roads serving resident communities.

2.2 Risks identified and proposed mitigation measures

The main risks associated with the re-surfacing project, and proposed mitigation measures are as follows.

2.2.1 Increased traffic, leading to increased number of road-kills and disturbance to wildlife

A re-surfaced road will improve accessibility for tourism and through traffic. As noted above, the number of vehicles using the road increased by a factor of 3.5 times between 2000 and 2013 (Table 1), and could increase at an even faster rate following improvement. This might result in a significant threat to the OUV of the property from a considerable increase in traffic volumes following the surface hardening project, unacceptable levels of disturbance to wildlife and an increase in the number of (wild and domestic) animals killed accidentally by vehicles, especially during the period from January to March when the migrating herds of wildebeest and zebra are amassed on the southern plains within the NCA. As long as the road remains fully within the jurisdiction of NCAA, these risks can continue to be mitigated satisfactorily through measures already in place, as observed by the mission. These include a size limit of allowed vehicles and road user charges (which have to be paid to NCAA and SENAPA). The mission also observed satisfactory enforcement of night time driving through the property, with official data showing that a net number of 11 vehicles remained inside the property overnight or significantly after hours in August 2014. In the absence of past data accessible to the mission, it is not possible to determine whether this was an increase from previous times, and whether there has been an increase or a decrease since the August 2014 study. However there remains a significant risk of political pressure to relax existing restrictions once the re-surfaced road is completed, especially if none of the three alternative through-routes (mentioned above, Section 1.2.2) is operational. Stringent management and disincentive measures thus need to be adopted to control any potential increase in traffic volumes, together with the need to complete urgently studies for, and the implementation of, alternative routes.

2.2.2 Diminished visitor experience (loss of wilderness qualities, visual and noise impacts)

There is a risk that some stakeholders (particularly some members of the international conservation community) will regard a surfaced road as inappropriate on the grounds that it diminishes the area's wilderness qualities and accelerates a range of development pressures. A surfaced road may be a more conspicuous visual intrusion in a natural landscape than a murram/gravel road, and (depending on choice of surface materials) there is a risk of increased noise pollution from vehicles travelling on a hard-surfaced road. To mitigate these risks NCAA has chosen a rigid concrete pavement rather than a tarmac (asphalt concrete) surface, as this provides a better 'colour match' (especially over the plains) and is readily distinguished from a 'standard' (tarmac) trunk road. Final decisions on surface texture (which might alter the road's ability to trap small particles of naturally-occurring soil and substrate materials for better colour-matching) have not yet been taken, but special attention to this issue was given in the development of the crater ascent road (where a special textured surface was used). Tyre-generated noise from a concrete hardened surface would only become a problem if vehicles were travelling at speeds higher than those permitted in the NCA, but this is unlikely as speed controls will be imposed through use of speed humps. As noted above,

the visual impact of the re-surfaced road might be considerably less than the present one if its finished width is reduced by re-processing the considerable quantities of waste material presently piled along the verges and incorporating this material into the road base during the construction phase.

2.2.3 Impact of extraction of construction materials within NCA

The project has been designed to make use of locally-available materials, thereby reducing the risk of inadvertently introducing invasive alien plants from outside the NCA. This means that considerable quantities of stone and related materials will need to be quarried within the NCA and large quantities of water (a scarce commodity) will be required, especially for concrete production and curing. Careful planning and management of this extractive activity is required, before, during and after the construction phase if long-term damage to the property's OUV is to be avoided. Observations by the mission of a (partially) restored borrow pit and discussions with NCA staff and consulting engineers suggest that work remains to be done towards development of suitable mitigation procedures for these potential impacts. There is a need to carry out initial surveys of environmental parameters, vegetation and possible archaeological interest prior to any site disturbance and make arrangements to ensure that ecological/archaeological restoration of disused sites can be carried out as fast and completely as possible at the end of the project.

Fig. 7. *Two of the 'borrow pits' used to supply gravel for maintenance of the existing road. The site on the right is no longer active and has been (partially) restored, but illustrates the extent of the impact on the property's OUV. ©IUCN/Peter Howard.*

2.2.4 Impact of construction activity

The construction phase of the project will involve short-term environmental impacts associated with the influx of workers, management and storage of construction materials as well as the use of heavy machinery and construction activity along the road corridor and could also impact on archaeologically sensitive areas. In recognition of the highly sensitive nature of the site the contractor should be required to comply with especially stringent environmental and archaeological standards that ensure that surveys are undertaken of possible archaeological interest prior to any site disturbance, and that short-term environmental/archaeological impacts are contained within the narrowest possible road corridor, whilst minimizing disruption and inconvenience to road users.

2.2.5 Importation and spread of exotic alien plants

A number of invasive alien plant species already occur within the NCA and efforts to control their spread are being made by NCA management. The decision to source all naturally-occurring construction materials from within the NCA was made primarily as a result of concern that materials

introduced from outside the conservation area might include the seeds of invasive species. Nevertheless close monitoring of the road corridor will be required throughout the construction phase as many invasive species favour disturbed habitats such as road verges. A potentially devastating weed, *Parthenium hysterophorus*, has been reported within the area and its potential spread along the road corridor and into surrounding grasslands requires careful monitoring and control.

3 ASSESSMENT OF PROPOSED ROAD HARDENING

3.1 Overall Strategy

3.1.1 Understanding of overall strategy

NCAA appointed Gauff Ingenieure Engineering Consultants, in association with University Consultancy Bureau, in December 2013, to carry out consultancy services for the upgrading of the T17 through NCA. The consultancy services were to be carried out in two phases. Phase 1 comprised the Feasibility Study and Preliminary Design which was completed in June 2015. Phase 2 comprised a detailed Environmental & Social Impact Assessment (ESIA) and Cultural and Heritage Impact Assessment (CHIA) and Detailed Engineering Designs including Tender Documents. The June 2015 Feasibility Study and Preliminary Design Report has been made available to the mission. The mission understands that the Detailed Design and Tender Documents were developed between February and June 2017 and have not, as yet, been issued to UNESCO, pending findings from the mission. However some aspects of the Detailed Design and Tender Documents were discussed with Gauff and NCAA during the mission's field visit.

3.1.1.1 Feasibility Study and Preliminary Design

The scope of the feasibility study was described as:

- Implementation of surveys and site investigations (including traffic studies, testing of in-situ materials, identification of potential sources of construction materials and water
- Implementation of preliminary engineering design
- Preparation of financial and economic cost estimates
- Scoping for implementation of ESIA and CHIA
- Economic assessment of options and sensitivity analyses of the same

The outcomes of the study are fully described in the Report 'Volume 1: Feasibility Study and Preliminary Design Report: Final: June 2015'.

Certain aspects of the design have the potential to have a particular impact on the OUV of the NCA. Those which are most pertinent at the current stage of the Project include:

1.	**Introduction to Traffic Studies Section 2.4.1**	Discusses the relative importance of the T17 (existing road) in the Tanzanian national road network, and alternative routes for 'through traffic' to the Lake Region outside the NCAA area
2.	**Design Traffic Loading Section 2.4.4.4**	Summarises detailed traffic studies based on historical, measured current (2014) traffic data and projected future traffic, and converts them to road design loading classifications

3.	**Materials Survey Section 2.6.3**	Describes the research carried out to source suitable road construction materials from within the NCAA boundary
4.	**Recommendations (of Analyses of Surface Requirements) Section 2.9.3**	Concludes that the design of the hardened road should conform to 'Principal Park Road' standards.
5.	**Geometric Design Section 3.4 and following sections**	Summarises the design criteria agreed with the Client (NCAA) in May 2014, although following sections indicate design speeds higher than 50 km/h may have been used.
6.	**Proposed Pavement Structures Section 3.5.3**	Gives options for different road surfaces and sub-grade build up below the surface.
7.	**Recommendations Section 8.2**	Gives the recommended surface hardening option after extensive economic analysis and taking into account environmental considerations.

The conclusion at this stage of the project was that surface hardening should comprise:

Lodoare Gate to NCAA junction (0-15km)	150mm concrete on 200mm C1 class subgrade
NCAA Junction – Golini Gate (15-83km)	50mm asphalt concrete on 150mm crushed rock and 200mm C1 class sub-grade
Olduvai Museum Road (5km)	Double Surface Dressing (two layers of bitumen applied with gravel chips sprinkled on top)

3.1.1.2 Detailed Design and Tender Documents

Whilst the Detailed Design and Tender Documents have not yet been made available to UNESCO or the mission, NCAA and Gauff Ingenieure answered various questions on the detailed design proposals and provided some clarification to the Project Brief document (February 2017) that had been presented to the World Heritage Committee that month.

The mission understands the following relating to the current proposed surface hardening project (pertinent points related to the above at preliminary design stage).

1.	**Introduction to Traffic Studies**	The T17 will continue to be managed and maintained by NCAA (and its continuation in Serengeti by SENAPA). Through traffic will continue to be discouraged from using this road by the restricted park opening hours (6am – 6pm), the entry fees for vehicles and enforcement of the speed limit of 50 km/h, even after surface hardening. Whilst the feasibility study for the proposed southern by-pass road is not yet complete, it is understood that TANROADS and the Government of the United Republic of Tanzania are committed to providing infrastructure connectivity to the Lake Zone without impact on the National Parks.

2.	**Design Traffic Loading**	The Project Brief refers to Tanzanian road pavement design classes TLC 03 and TLC 10 which relate traffic volumes and types of vehicles to 'design axle loads'. It is not clear which load class is applied in which section of the Lodoare – Golini Road although it is understood that the final proposed design adopted was for 200mm concrete. This implies TLC 10, with a 30 year design life was adopted throughout the project.
3.	**Materials Survey**	It is understood that materials investigations at possible quarry and borrow pit sites within NCAA revealed that suitable road construction materials could be found only at 4 out of 8 existing borrow pit sites, and 2 possible quarry sites. (A 3rd possible quarry site was found to contain suitable construction material but was rejected on account of its archaeological value by the CHIA consultant.)
4.	**Recommendations (of Analyses of Surface Requirements)**	No changes understood from preliminary design stage (maximum design speed of 50 km/h maintained)
5.	**Geometric Design**	No changes understood from preliminary design stage. Geometric design includes no change to horizontal alignment of the existing road with the exception of the approach to the bridge over the Olduvai River at chainage +70 to allow better visibility on the approaches to the bridge.
6.	**Proposed Pavement Structures**	A pavement design of 200mm concrete for TLC 10 (30 year design life) and 150mm concrete for TLC 03 (20 year design life) is proposed. It is unclear where the two sections have been applied in the detailed design and the mission generally understood that the 200mm concrete proposal has been adopted throughout the entire length of the road.
7.	**Recommendations**	As item 7 above.

It is apparent, therefore, that, whilst many considerations remain the same as a preliminary design stage, there has been a significant shift in the choice of pavement design for the surface hardening over the intervening period.

3.1.2 Comment on overall strategy

It is to be expected in any project, that decisions made early in the design process are subject to change as the Project progresses. However it is often worthwhile, particularly in projects with a long timescale and very specific requirements, to take stock and confirm that the original criteria are being met in the final design, or, if indeed there are changes, the reasons for those changes are fully understood and documented.

The overarching requirement when considering the surface hardening project, is to ensure that the OUV of the NCA are maintained. Apart from the overall risks associated with the Project, (see Section 2.2 above), the requirements for materials for construction will have a significant impact on the NCA. The strategy for the design and construction of the surface hardening of the road can either exacerbate or reduce the risk of materials sourcing impacts on the OUV.

Whilst there are always tensions between conflicting requirements on any sensitive project, the mission recommends that the State Party reviews certain aspects of the proposed design to clarify and confirm that the optimal strategy is being followed.

Review of design brief	Inter alia: • Confirm that the design standard is that of Principal Park Road and not a Trunk Road (is there any form of agreement with TANROADS or other applicable authorities on this?) • Confirm the road's classification as a Principal Park Road. • Confirm that the design speed is maximum 50 km/h and that the vertical and horizontal alignment is designed for this speed (not higher speeds) and, as such, **the existing road alignment can be maintained**. • Confirm that the maximum 50 km/h speed limit for vehicles using the road will be managed through a combination of 'hard' measures such as speed bumps, and 'soft' measures such as electronic vehicle tracking, strict penalties etc. to avoid any detrimental impacts on OUV. • Confirm whether the 30 year design life is required, or whether 20 years is acceptable for some sections of road (e.g. 5km access road to Olduvai Gorge). • Confirm the traffic loading class required for all sections of the road and whether the hardening solutions should reflect the loading classes.
Review of surface hardening solution	Inter alia: • Clarify the decision making process which resulted in the change from the proposed surface hardening solution at preliminary design stage to that proposed at detailed design stage. • Confirm that the materials required for the entire scope of the project (concrete structures, drain lining, materials to make up levels, sub-grade materials, concrete surfacing) can be found at the two new quarry sites and four existing borrow pit sites identified within NCA and that further quarries / borrow pits are not likely to be required during the course of the Project. • Confirm how much of the water quantity required for construction of the road, including curing of the concrete surface after casting, can be obtained from the two water sources identified within NCA, without depleting the base water requirement for ecological and environmental needs.
Review of design detail	Inter alia: • Review best practice in speed control measures to ensure the design speed is adhered to, particularly on the long, straight sections of the road. (Note: this may include future management systems e.g. vehicle tracking or other technology in addition to physical measures such as speed humps.) • Review best practice in design of surface water drainage from the road including the visual impact of lined catch water drains separated from the typical road cross section. Review typical drain and discharge design to reduce potential erosion at outlet positions.

	• Review level of detail in tender design documents to ensure that the appropriate level of control can be applied during the construction works, without unapproved / uncontrolled variation by the Contractor. • Review whether any aspects of the design can be adjusted, following review of the design brief and loading classes, to limit the requirements for resources obtained from with NCA, without compromising safety or longevity of the design.
Review of Construction Contract Terms and Construction Supervision procedures	Inter alia: • Review standard contract terms understood to be proposed in the tender documents and any special conditions required to ensure that the Contractor adheres to strict standards in quality of construction and environmental management during the works. • Review anticipated construction supervision team and appointment thereof, to ensure designed details are followed through in every aspect of construction and environmental management during the works.

3.2 Environmental and Social and Cultural and Heritage Impact Assessments

3.2.1 Overview

The project Environmental and Social Impact Assessment (ESIA) and Cultural and Heritage Impact Assessment (CHIA) were carried out in 2016 following scoping of the studies as part of the Preliminary Design Stage in 2015. The assessment, issued as draft final in April 2016 were carried out in accordance with the relevant Tanzanian legislation (Environmental Management Act No 20, URT, 2004 and associated regulations) and with reference to the IUCN World Heritage Advice Note on Environmental Assessment[2].

The ESIA report includes inter alia:

- A summary of the significant impacts of the project (positive and negative)
- An assessment of project alternatives
- Mitigation measures and mitigation plans
- Environmental and social monitoring plans
- Cost benefit analysis
- Statement on decommissioning

The CHIA report includes inter alia:

- Assessment methodology
- Site history and description
- Impact assessment and evaluation

[2] IUCN World Heritage Advice Note on Environmental Assessment (2013) https://cmsdata.iucn.org/downloads/iucn_advice_note_environmental_assessment_18_11_13_iucn_template.pdf.

Most pertinent at this stage of the Project are the following statements and findings from the reports:

Reference	Statement from ESIA/HIA Report	Comment from the mission
ESIA Section 5.4	Increased demand for construction materials for repair (of the current road) has depleted significantly the source of materials thus causing another environmental concern to NCA status as a World Heritage site.	Concurred. However, management of the current situation can be and should be improved in the interim whilst awaiting completion of the hardening project (see comments in section 3.4 below).
ESIA Section 5.4	Upgrading the (road) to hardened standard will also require construction materials such as gravel, sand and stone from the same NCA adding more environmental degradation as the GMP does not allow use of construction materials from outside the NCA.	The GMP for NCA has not been seen but the general requirement to use materials from within NCA is understood as is necessary to avoid the spread of exotic and invasive species. However, for a project of such scale, there is a tension between the requirements to avoid importation of materials from outside NCA and the degradation of the NCA itself.
HIA Section 7.0	There may be no risk to the inscription of the site as a WH property, because Olduvai Gorge proper and Laetoli sites that were used for the extension of NCA to a mixed WH site in 2010 may not be directly impacted by the proposed project.	It is true that the Olduvai Gorge and Laetoli sites will not be affected directly by the Project. However the 2010 inscription under criterion iv was 'justified for the paleo-archaeological sites and the wider landscape'. It is therefore necessary that the Project considers potential impacts to archaeological sites in the wider landscape in conjunction with impacts to specifically identified and documented sites.

The ESIA considers the question of surface hardening material alternatives and also makes a number of recommendations for mitigation and enhancement measures.

3.2.2 Surface Hardening Alternatives

The ESIA considers the three hardening options proposed within the preliminary engineering design report: asphalt concrete (AC), concrete and interlocking concrete pavements. Comments are given on each in relation to heat effects, surface water run-off and typical environmental impacts including carbon footprint.

Whilst various statements are made regarding the proposed alternatives, the conclusion **'to use concrete materials throughout the road'** (ESIA Section 7.4) appears to have been made without reference to the quantity and availability of materials within and outside the NCA for the various

options. Sources of materials (stone and water) are identified (ESIA Sections 6.4.5 and 6.4.6) but there is no assessment of the quantity of material available or the material demand of the proposed alternatives.

The evaluation of alternatives also appears not to compare the visual impact of the various options within the landscape, nor the noise generated by traffic on different running surfaces.

3.2.3 Mitigation and Enhancement Measures

Section 8 of the ESIA, capturing the recommendations of the CHIA, contains a significant number of mitigation measures which are highly necessary for the Project to be completed without unacceptable impact on the OUVs of the NCA.

All of the mitigation measures should be noted and will affect the design, the preparation for, procurement of, the implementation of and decommissioning of the construction stage of the Project. NCAA and their consultants should use the points noted as a check list against which the tender documents and procurement plan is reviewed.

Examples of specific actions which will mitigate negative impacts on the OUVs include:

i) **Section 8.1 a) 'Soil erosion and land sliding'**, notes that 'engineering design should dampen or break the power of flowing water current where drainage empties water to the environment'. Thus at detailed design stage, the Engineering Design Consultant should ensure that typical details are reviewed and, if necessary, adapted, to minimize the potential for soil erosion coming from the run off from the road, as is currently observed particularly from approximately chainage +40.000 to +50.000 on the existing road.

ii) **Section 8.4 c) 'Degradation of potential archaeological sites that might be located in the project area',** notes that spoil soil that goes beyond one metre should be subjected to the Chance Finds Procedure as per IFC Performance Standard 8, paragraph 8.

iii) **Section 8.4 a-d) 'Loss of / degradation of Middle Stone Age and Later Stone Age artefacts,** notes that detailed archaeological surveys and shovel test pits are to be carried out in various locations impacted by the Project.

3.2.4 Further Comments on Environmental, Social, Cultural and Heritage Impacts

The mission welcomes the detail included in the ESIA and CHIA reports but would further note the following recommendations not highlighted in the documents.

i) **Visual impact of surface hardening alternatives**

The ESIA report does not include a comparison of visual impact of the surface hardening alternatives or advise on the way the visual impact of any of the alternatives can be mitigated. In addition to the colour studies carried out by the Engineering Consultant, treatment of the surface of the road can positively affect the way in which wind blown soils cling to the surface and help it blend with the surrounding environment.

If a concrete surface is implemented, consideration should be given to brushing or otherwise roughening the surface to allow wind blown soils to 'colour' the surface and reduce the visual impact.

ii) **Visual impact at typical sections**

The 'visual width' of the road can be much greater than the designed carriageway width unless measures are taken at design and construction stages to minimise the apparent width of the impacts. This is observed at present in the section of road between approximately chainage +40.000 and +50.000 where catch water channels are located 1-2m away from the road itself, and at chainage +55.000 to Golini Gate where spoil cast off during the frequent regarding operations lies 1-2m either side of the carriageway.

The design and tender documents should be reviewed to address the way in which the apparent width of the road can be limited to, as close as possible, the actual width of the road and how this will be managed during construction.

iii) **'Zero waste' policy at borrow pits / quarries**

The considerable spoil heaps at the side of the road from approximately +55.000 to Golini Gate reflect the amount of material that is 'wasted' during regular maintenance operations, and adds to the volume of material that is excavated from borrow pits. It is understood that this material can not be used as NCAA do not own a mobile crusher that could be used to make this spoil usable.

This spoil can be collected, subjected to the Chance Finds Procedure, and used during the Project if the Contractor is required to provide a crusher. In addition, there should be a 'zero waste' policy at borrow pits and quarries during the works so that as much of the extracted material as possible can be used during the upgrade Project, thus minimising the amount of extraction required. This should be built into the Contractor procurement requirements so that the cost of such efforts can be built into the Contract.

iv) **Further advice on gravel / sand material sourcing**

In addition to the need for archaeological investigations in advance of the Project, an estimate of the gravel, sand and base / sub-base materials should be carried out and compared with the estimated yield from the proposed borrow pits and quarry sites. These estimates, taking into account the availability of different types of material and their suitability for the works, should be used in the evaluation of surface hardening options.

If the quantity of suitable materials can not be found within NCA, the nature, quantity and management of materials sourced from outside must be understood and plans put in place to mitigate the possible introduction of invasive alien species.

v) **Further advice on water sourcing**

Whilst the possible sources of water for the Project are described and understood, no estimate of the quantity of water required for the project has been carried out, or taken into account in the evaluation of surface hardening options. Limits for water abstraction at the sources within NCA should be determined, built into the tender documents and enforced during the Project.

This is essential to maintain the fragile water balance within the NCA and failure to define and comply with water restrictions could have a serious long term impact on the OUVs of NCA.

vi) **Further advice on decommissioning of borrow pits / quarries / water sources**

The ESIA notes the need to manage the impacts of decommissioning the Project but very few specifics are given. Baseline monitoring of potentially impacted areas (eg. borrow pits, quarries and water sources) needs to be carried out by NCAA in advance of the Project works being approved, and, in the case of water sources, through wet and dry seasons in advance of the Project works. (It is noted that some of this monitoring is part of NCAA's GMP and carried out on a regular basis for other purposes.)

Where specific requirements are necessary during decommissioning of the Project Contractor's works, these must be carefully detailed in the tender documents and examples given so that the expected standard after decommissioning is transparent and budgeted for in the Contract.

vii) **Prioritisation of detailed archaeological surveys and shovel test pits**

The CHIA notes the need for detailed archaeological surveys and shovel test pits to be carried out at the proposed sites for material abstraction for the Project. These are required **in advance** of the Project works to ensure 'proper documentation, conservation and management of the rescued cultural resources and archaeological sites'.

These investigations and surveys prior to the Project are not only vital to the integrity and authenticity of the NCA under criterion (iv) of the OUV, but necessary for successful risk management in the delivery of the Project. Should significant artefacts be found in the proposed material sources, this will have a significant impact on the execution of the Project. Such discoveries, if any, and resulting re-evaluation of the implementation strategy should therefore be carried out without the pressure of a Contractor's Contract Programme when decisions might be taken in haste which prove detrimental to the OUV of the NCA.

3.3 Progress with survey and documentation of sensitive areas

As noted above, the ESIA and CHIA call for preparatory vegetation and archaeological surveys at the proposed quarry, borrow pit and dredged water source locations. In addition, archaeological shovel test pits are required where drainage structures and bridges are to be constructed.

It is understood that none of these test pits have been carried out to date.

The mission urged NCAA to commence these surveys as soon as possible to verify whether or not significant archaeological heritage is located in these locations as this would have a significant impact on the availability of proposed construction materials for the Project. Whilst the Chance Finds Procedure will apply throughout the Project, the preparatory surveys should be carried out in advance of the surface hardening project, as noted above.

4 Conclusions and Recommendations

4.1 Conclusions

a) The current and anticipated future volume of traffic on the road from Lodoare Gate – Golini Main Road justifies the improvement of the road from its current gravel surface to a hardened standard.

b) Design of the proposed surface hardening has taken place and tender documents prepared, including an ESIA and CHIA.

c) The surface hardening will have multiple positive benefits for tourists, travelers and NCAA, and may also, significantly, serve to reduce long term negative impacts on the property's OUVs associated with the current road.

d) The surface hardening project will have negative impacts on the property's OUVs but these must mitigated through the careful implementation of various preliminary measures before full details are agreed and measures through the Project planning, design, implementation and de-commissioning stages.

e) Regardless of progress with implementation of the surface hardening project the negative environmental impacts associated with maintenance of the current road need to be addressed.

f) The proposed surface hardening specifications appear to go above and beyond the stated design requirements (for some sections of the road) and should be reviewed, before full details are agreed, with a view to reducing the potential impact of excessive construction material demands.

4.2 Recommendations

The mission makes the following recommendations:

R1. The road hardening project can be implemented, subject to provisions detailed in the ESIA and HIA, including the necessary mitigation measures (see also R2) and by applying a phased approach (see also R7) to enable adjustments to be made, as required, as project implementation progresses, in order to mitigate potential impacts on the natural and cultural heritage values of the property. Before finalizing the planning phase of the project, NCAA and its Consultants should review the proposed detailed design and the mitigation measures in the ESIA, CHIA and the recommendations in this report, and modify details as necessary to conform to World Heritage requirements.

R2. The mitigation measures should include a specific action plan to ensure traffic through the property does not increase as a result of upgrading the road. This action plan should be submitted to the World Heritage Centre and the Advisory Bodies for review, and be updated periodically by NCAA based on the evolution of the traffic demand. The road should be formally classified as a park road (instead of a trunk road) and be placed fully under the jurisdiction of NCAA. This will guarantee that NCAA can implement the necessary measures to regulate the traffic which are part of the above mentioned plan and maintain measures presently in place to limit the opening hours and type of vehicles allowed as well as restricting through traffic. Present monitoring of through traffic should be continued and fee schedules adjusted to further discourage through traffic and heavy commercial

vehicles as necessary. An increase in fees for these classes of road user may be required to counter the attraction of using the improved road after resurfacing.

R3. Urgently seek finalization of the feasibility study for the southern by-pass route(s) to the lake shore regions, and promote its adoption as part of a strategic national and regional transport plan, and its implementation;

R4. Prior to completion of tender documents for the road hardening project, NCAA should develop suitable environmental and archaeological management standards, over and above statutory requirements, based on a thorough review of the recommendations of the ESIA, HIA and this mission. In further compliance with Paragraph 172 of the *Operational Guidelines* these management standards should be submitted to the World Heritage Centre in draft form so that they can be reviewed and (if necessary) revised before they are included as a tender requirement. These may include topics such as the acceptable limits of damage to roadside vegetation during construction and the procedures to be followed in preparing and rehabilitating borrow pit sites (including, for example, the temporary storage of topsoil), water courses and other areas impacted by the project. The aim of establishing such standards should be to ensure that ecological restoration can be achieved as fast and fully as possible following completion of the project. The proposed tender documents and form of contract should be reviewed and if necessary revised to ensure full compliance with these environmental management standards during project implementation including provisions for monitoring and enforcement.

R5. NCAA should ensure that it has the technical and human resource capacity to monitor and enforce the required standards of environmental and archaeological management during all stages of the project, and if necessary develop this capacity before the start of the project.

R6. Prior to commencement of the construction phase, areas that will be subject to direct project-related impacts (such as water sources, downstream wetlands, quarries, borrow pits, road camps) should be subject to baseline vegetation and archaeological surveys to ensure that they are not of special significance, while also allowing for rapid, complete restoration at de-commissioning;

(iv) Archaeological investigations must be carried out as a priority as substantive findings will affect the viability of the proposed design solution.
(v) Ecological and environmental baseline surveys need to be commenced now in order that seasonal variations can be recorded. These surveys will include, amongst others, species inventories and measures of relative abundance, basic vegetation mapping and fixed point photographic reference.
(vi) Surveys should be carried out along the length of the road to record the baseline in terms of ecology, location of vegetation with respect to the existing verges, state of soil erosion due to surface water run-off, presence of exotic species, etc.

R7. A phased approach should be adopted, allowing for adaptation of design standards and implementation procedures as practical experience of construction outcomes, material sourcing constraints and environmental concerns is gained. This is especially important in view of the fact that NCAA's preferred surfacing option (200mm thick solid concrete pavement) will require very large quantities of materials, with correspondingly heavy localized environmental impacts at quarries, borrow pits, water sources and downstream wetlands. NCAA might consider Phase 1 of the

project to be the most heavily used section of road from Lodoare Gate to NCCA HQ or Seneto Junction (+0.000 to +15.000 or +29.000), with subsequent phases taken as +29.000 to the base of the hill at approx. +43.000, then +43.000 to Golini Main Gate. As part of the phased approach NCAA should:

(v) Reconsider the possible use of asphalt concrete (including the addition of colour) for the sections of road subjected to lower traffic pressure, on the grounds that it could significantly reduce the quantity of materials required and the associated environmental damage.

(vi) Consider the use of geocell in conjunction with asphalt concrete and concrete surfacing, to reinforce the road base / sub-base, enable lower quality fill material to be used from existing borrow pits and reduce the overall material demand from within NCA (subject to design).

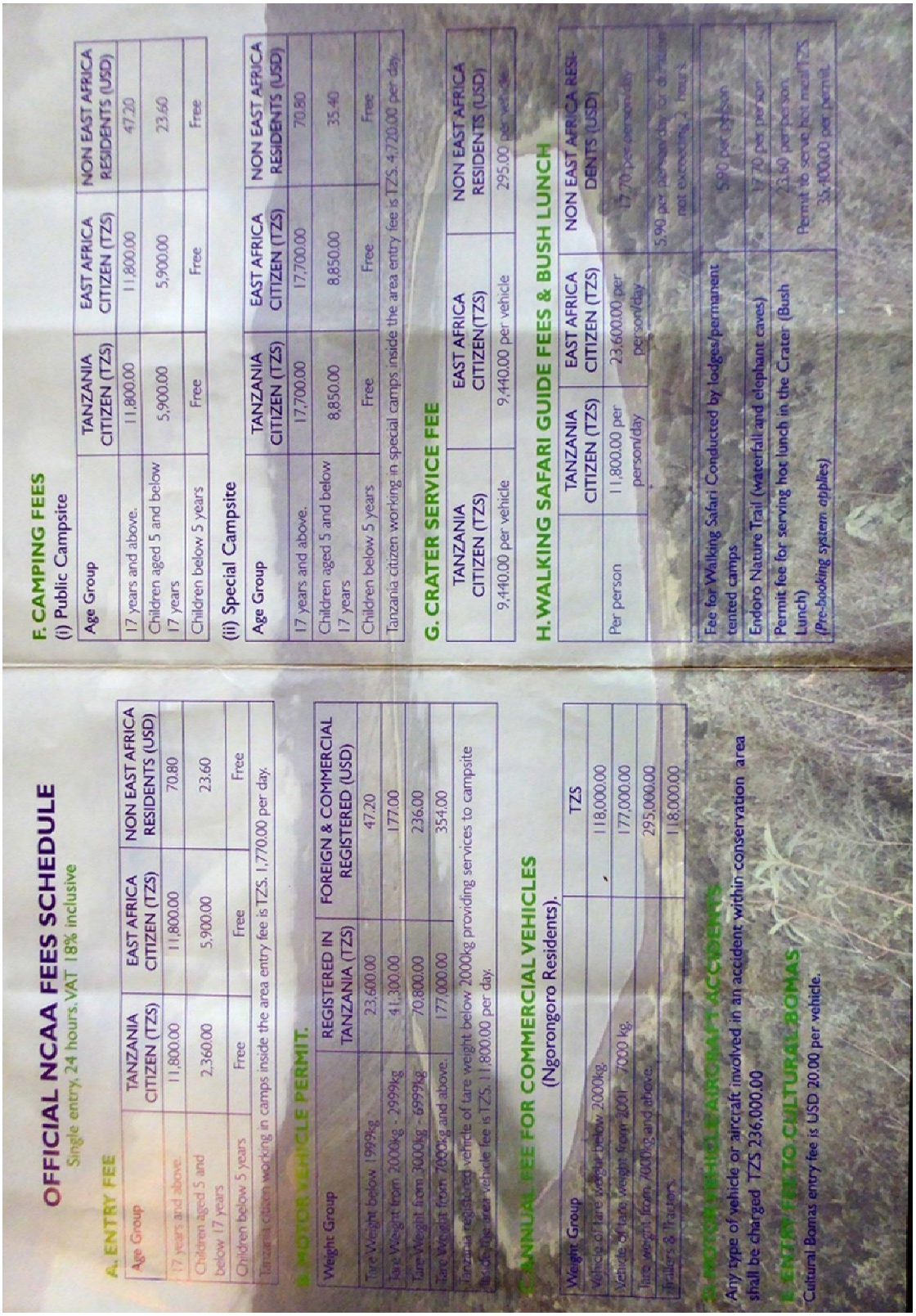
(vii) Consider the Olduvai Museum road separately to the remainder of the road from a design and implementation point of view, just as the Crater ascent and descent roads are not included in the surface hardening project. A similar 'softer' approach to surface hardening could be used for the 5km road to the museum, reflecting the lower traffic volumes. 'Softer' approaches could include the use of interlocking paving blocks or geocell membranes to reinforce a gravel road (subject to design).

(viii) Recognising the general requirement to avoid importation of gravel materials from outside the NCA, consider whether it may be preferable to permit such importation for a specific project such as this, in controlled circumstances, rather than depletion of resources (gravel and water) from within NCA. Careful management of the excavation and importation of gravels from outside NCA could include removal of top soil and associated seeds / vegetation prior to quarrying thereby reducing the risk of importation of exotic species. Storage of the imported stone / gravel away from other native vegetation will also help the identification and removal of imported species. Such an approach could be preferable in light of the quantity of materials needs for the surface hardening project.

R8. As an interim measure prior to surface hardening NCAA should review the method of maintenance of the existing unpaved road, particularly in the section across the plains from +43.000 to Golini Gate. The review should include options such as enforcement of the speed limit of 50 km/h to reduce degradation, inclusion of geocell reinforcement to increase longevity of the gravel surface and management of the (unsightly) waste material at the road-side, not used within the surfacing.

5 Annexes

5.1 Annex 1. Official NCAA Fees Schedule



OFFICIAL NCAA FEES SCHEDULE

Single entry, 24 hours. VAT 18% inclusive

A. ENTRY FEE

Age Group	TANZANIA CITIZEN (TZS)	EAST AFRICA CITIZEN (TZS)	NON EAST AFRICA RESIDENTS (USD)
17 years and above.	11,800.00	11,800.00	70.80
Children aged 5 and below 17 years	2,360.00	5,900.00	23.60
Children below 5 years	Free	Free	Free

Tanzania citizen working in camps inside the area entry fee is TZS. 1,770.00 per day.

B. MOTOR VEHICLE PERMIT.

Weight Group	REGISTERED IN TANZANIA (TZS)	FOREIGN & COMMERCIAL REGISTERED (USD)
Tare Weight below 1999kg	23,600.00	47.20
Tare Weight from 2000kg - 2999kg	41,300.00	177.00
Tare Weight from 3000kg - 6999kg	70,800.00	236.00
Tare Weight from 7000kg and above.	177,000.00	354.00

Tanzania registered vehicle of tare weight below 2000kg providing services to campsite inside the area vehicle fee is TZS. 11,800.00 per day.

C. ANNUAL FEE FOR COMMERCIAL VEHICLES

(Ngorongoro Residents).

Weight Group	TZS
Vehicle of Tare weight below 2000kg	118,000.00
Vehicle of Tare Weight from 2001 - 7000 kg.	177,000.00
Tare weight from 7000kg and above.	295,000.00
Trailers & Tractors.	118,000.00

D. MOTOR VEHICLE/AIRCRAFT ACCIDENTS

Any type of vehicle or aircraft involved in an accident within conservation area shall be charged TZS 236,000.00

E. ENTRY FEE TO CULTURAL BOMAS

Cultural Bomas entry fee is USD 20.00 per vehicle.

F. CAMPING FEES

(i) Public Campsite

Age Group	TANZANIA CITIZEN (TZS)	EAST AFRICA CITIZEN (TZS)	NON EAST AFRICA RESIDENTS (USD)
17 years and above.	11,800.00	11,800.00	47.20
Children aged 5 and below 17 years	5,900.00	5,900.00	23.60
Children below 5 years	Free	Free	Free

(ii) Special Campsite

Age Group	TANZANIA CITIZEN (TZS)	EAST AFRICA CITIZEN (TZS)	NON EAST AFRICA RESIDENTS (USD)
17 years and above.	17,700.00	17,700.00	70.80
Children aged 5 and below 17 years	8,850.00	8,850.00	35.40
Children below 5 years	Free	Free	Free

Tanzania citizen working in special camps inside the area entry fee is TZS. 4,720.00 per day.

G. CRATER SERVICE FEE

TANZANIA CITIZEN (TZS)	EAST AFRICA CITIZEN(TZS)	NON EAST AFRICA RESIDENTS (USD)
9,440.00 per vehicle	9,440.00 per vehicle	295.00 per vehicle

H. WALKING SAFARI GUIDE FEES & BUSH LUNCH

	TANZANIA CITIZEN (TZS)	EAST AFRICA CITIZEN (TZS)	NON EAST AFRICA RESIDENTS (USD)
Per person	11,800.00 per person/day	23,600.00 per person/day	17.70 per person/day
			5.90 per person/day for duration not exceeding 2 hours
Fee for Walking Safari Conducted by lodges/permanent tented camps			5.90 per person
Endoro Nature Trail (waterfall and elephant caves)			17.70 per person
Permit fee for serving hot lunch in the Crater (Bush Lunch) (Pre-booking system applies)			23.60 per person. Permit to serve hot meal TZS 35,400.00 per permit.

5.2 Annex 2. Terms of Reference for the Advisory Mission

Further to Decision 41 COM 7B.39 of the World Heritage Committee, the State Party of the United Republic of Tanzania has requested an advisory mission to **Ngorongoro Conservation Area** (NCA) World Heritage property in order to monitor progress and advise the State Party on the project concerning the Lodoare Gate to Golini Main Road, and the Access Road to Olduvai museum from gravel to hardened standard. This request for a WHC/ICOMOS/IUCN Advisory mission was made by the State Party in a letter dated 1 August 2017 to the World Heritage Centre, and followed discussions concerning the timing of the joint WHC/ICCROM/ICOMOS/IUCN Reactive Monitoring mission that was requested by the Committee per the above-mentioned decision. The Reactive Monitoring mission could not be undertaken in August 2017 due to the unavailability of suitable experts to cover the full mandate of the mission. The Reactive Monitoring mission to the property will be organized at a later stage. After further discussions between UNESCO and the Advisory Bodies, it was decided that the Advisory mission would be carried out by one IUCN expert and one ICOMOS expert on Loduare – Golini road project.

The Advisory mission will carry out the following tasks:

1. Hold consultations with the Tanzanian authorities at national, regional and local levels, including representatives of the Ngorongoro Conservation Area Authority (NCAA), Tanzania National Parks (TANAPA), Ministry of Natural Resources and Tourism and management authority of the Serengeti National Park World Heritage property. In addition, the mission should hold consultations with stakeholders as relevant, such as: i) representatives of local communities who live within the property, including the Maasai pastoralists; ii) representatives of the tourism sector; iii) relevant scientists, researchers and experts.
2. Assess the overall strategy for the upgrading of the Lodoare Gate to Golini Main Road, and the Access Road to Olduvai museum from gravel to hardened standard, the Environmental and Social Impact Assessment (ESIA) and the Heritage Impact Assessment (HIA) that have been undertaken, and progress with survey and documentation of archaeologically and/or ecologically sensitive areas;
3. Based on these assessments, stakeholder consultations and visits to key locations (including proposed borrow pit sites, selected existing and rehabilitated borrow pits, sites proposed for dredging and deepening of water sources, as well as those paleontological sites, especially around the Olduvai Gorge area, that may be impacted by the project, advise on measuring and mitigating any impacts on the Outstanding Universal Value (OUV) of the property that may result from increased use of the road and possible increased tourism;
4. Based on the assessment of available information and discussions with the State Party representatives and stakeholders submit to the World Heritage Centre a consolidated report on the findings and recommendations of this Advisory mission in the format agreed between the WHC and ABs concerned no later than 10 days after the completion of the mission.

5.3 Annex 3. Mission itinerary

DAY ONE: Wednesday, 23rd August 2017

When	What	Venue
06.15am – 12.30pm	Consultants travel Nairobi-Arusha by road	Travel by road
12.30am – 1.30pm	NCAA Director General meets consultants	NCAA Liaison Office, Arusha
1.30pm – 2.30pm	Lunch in Arusha	NCAA Liaison Office, Arusha
2.30pm – 3.30 pm	➢ Consultations with Representatives of the Tourism Sector - TATO	TATO Office/Arusha
4.00pm – 5.15 pm	➢ Consultations with TANAPA	TANAPA Office/Arusha
5.30 pm – 7.30 pm	➢ Drive to Karatu – Hotel Check in	Acacia Farm Lodge, Karatu

DAY TWO: Thursday, 24th August 2017

When	What	Venue
8.00 am– 9.00 am	➢ Travel by road Karatu to NCAA headquarters.	KARATU/NCA
9.00am – 9.30am	➢ Meet with NCAA Chief Engineer, Consultants	NCAA Headquarters
9.30 am – 5.30 pm	➢ Drive along Loduare – Golini road, access road to Museum ➢ Visit to existing borrowpits, ➢ Packed Lunch	NCA
5.30pm – 6.30pm	➢ Travel by road NCAA Hq to Karatu	Road

DAY THREE: Friday, 25th August 2017

When	What	Venue
8.30 am – 9.30 am	➢ Travel Karatu to NCAA Hq	Road
10.00 am – 11.00 am	➢ Consultations with Chief Park Warden, Serengeti National Park	NCAA Hq
11.15am – 12.30 pm	➢ Consultations with Pastoral Council Chairman/Executive committee	NCAA Hq
12.30 pm – 2.00 pm	➢ Consultations with consulting engineers	NCAA Hq
2.00 pm – 4.00 pm	➢ Lunch at Serena Hotel (hosted by NCAA)	Serena Hotel
4.30 pm – 5.30 pm	➢ Wrap-up meeting with NCAA staff	NCAA Hq
5.30pm – 6.30pm	➢ Travel by road NCAA Hq to Karatu	Road

DAY FOUR: Saturday, 26th August 2017

When	What	Venue
5.30 am – 11.00 am	➢ Visit to Ngorongoro Crater	NCAA
11.00 am – 6.00 pm	➢ Drive Karatu to Nairobi	Travel

5.4 Annex 4. Consolidated list of persons met during the mission

Institution	Name
Ngorogoro Conservation Area Authority	Dr. Freddy S. Manongi
	Eng. Joshua Mwankunda
	Eng. Eugene Soka
	Cosmas Chikoti
	Shaban Felician
	Novatus Magoma Mwilili
UNESCO National Commission of Tanzania	Erick J. Kajiru
University of Dar es Salaam CEoT	Donatius Kamamba
H. P. Gauff Ingenieure	Thorsten Seitz
	Yusufu S. Yusufu
University Consultancy Bureau / H. P. Gauff Ingenieure	Dr. Edwinus Lyaya
Tanzanian Association of Tour Operators	Sirili Akko
Tanzania National Parks	Joseph M. Kessy
	Emmanuel Igiha
	Massana G. Mwishawa
	Jeremiah C. Machibya
	Fredrick M. Mofulu
	Emilian Kihwele
Serengeti National Park	William Mwakilema
Ngorongoro Pastoral Council	Shutuk Kitamwasi
	Peter K. Metele
	Emmanuel Tonge

5.5 Annex 5. Photos

Pre-entrance gate at Lodoare showing the existing tarmac road serving Ngorongoro (which finishes at the boundary (Photo 1, left). Safari vehicles at the NCA entrance (Lodoare Gate) (Photo 2, right). ©IUCN/Peter Howard.

Present condition of the unsurfaced murram/gravel road through the NCA. Dust on road-side vegetation (Photo 3, left) and dust thrown up by passing vehicles (Photo 4, right). ©IUCN/Peter Howard.

Present condition of the unsurfaced murram/gravel road through the NCA. Dusty travelling conditions (Photo 5, left) and unsightly waste material along the road verge (Photo 6, right). ©IUCN/Peter Howard.

Present condition of the unsurfaced murram/gravel road through the NCA. Wide, bare, unsightly verge (Photo 7, left); roadside powdery dust illustrate the limited suitability of available material (Photo 8, right). ©IUCN/Peter Howard.

Present condition of the unsurfaced murram/gravel road through the NCA. Wide, bare, unsightly verges near Golini (Photo 9, left); Gulley erosion scars at the road verge (Photo 10, right). ©IUCN/Peter Howard.

Borrow pit, illustrating the extent of environmental impacts related to present road maintenance requirements (Photo 11, left); team discussion during the field mission (Photo 12, right). ©IUCN/Peter Howard.


Existing road conditions result in frequent breakdowns and high vehicle maintenance costs (Photos 13 & 14). ©IUCN/Peter Howard.


Roadside puncture repair (Photo 15, left); existing culvert subject to periodic flooding, will be replaced with a more substantial bridge to ensure24-hour access for protection and management (Photo 16, right). ©IUCN/Peter Howard.

One of the local buses that uses the Ngorongoro road as a through road between Musoma and Arusha (Photo 17, left); Supply vehicles approaching the crater rim (Photo 18, right). ©IUCN/Peter Howard.


Supply vehicles outside the entrance gate in the early morning, waiting for opening time (Photo 19, left); Safari vehicle congestion in the crater floor (Photo 20, right). ©IUCN/Peter Howard.


One of the traditional Maasai bomas (homesteads) of the resident pastoralist population (Photo 21, left); view of the Ngorongoro crater from the top of the descent road (Photo 22, right). ©IUCN/Peter Howard.

Marker pillar highlighting one of the geological features that contributed to the recent listing of NCA as a Global Geopark (Photo 23, left); New visitor centre at Olduvai Gorge (Photo 24, right). ©IUCN/Peter Howard.


View of wildlife on the floor of the iconic Ngorongoro crater (Photo 25, left); lion (Photo 26, right). ©IUCN/Peter Howard.


Wildlife in the Ngorongoro Crater. Hippos (Photo 27, left); Wildebeest (Photo 28, right). ©IUCN/Peter Howard.


Fausto, a 55-year old female black rhino (believed to be the oldest rhino in the world) is protected against natural predators within a fenced 'boma' in the crater (Photo 29, left); wildlife photography in the crater (Photo 30, right). ©IUCN/Peter Howard.