CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Seventy-fourth meeting of the Standing Committee
Lyon (France), 7 - 11 March 2022

Administrative and financial matters

REVIEW OF THE ETIS PROGRAMME: REPORTS

This document has been submitted by the Secretariat in relation to agenda item 12* and contain the full reports relating to the review of the ETIS programme prepared by independent consultants:

a) Annex 1 : Full consolidated ETIS Review report

b) Annex 2 : Technical report - Data management and statistical analysis

* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

Review of the Elephant Trade Information System (ETIS)

FINAL CONSOLIDATED REPORT

29 NOVEMBER 2021

This report was prepared under contract from the CITES Secretariat by the Governance and Business Process Specialist - Camillo Ponziani - with input from Daniela Di Filippo, the Data Management and Statistical Analysis Specialist, where appropriate and leveraging relevant sections from her deliverable as needed to fulfill the requirements in the Terms of Reference.

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This report was produced with the financial support of the People's Republic of China and the Netherlands. Its contents are the sole responsibility of the ETIS Review Team and do not necessarily reflect the views of the hte People's Republic of China and the Netherlands.

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Acknowledgements

First and foremost, this review of the Elephant Trade Information System (ETIS) is not the work of the review team alone, but is rather a joint effort representing the collective input by all the partners, Parties to CITES and stakeholders involved, who gave freely of their time, input and unique perspectives, which have certainly enriched the analysis of the review and its key findings.

The ETIS review was carried out by Camillo Ponziani and Daniela Di Filippo, and was completed under the guidance and supervision of the CITES Secretariat. The review team is grateful to Thea Carroll for being a source of second sober thought, a sounding board on the approach taken and for her passion and commitment to getting the most out of the review process. The review team would like to thank CITES Secretariat senior management staff who provided their time, expertise and vetting of various materials shared by the consultants during virtual consultations. In addition, the review team would like to thank the staff from TRAFFIC, and in particular, would like to acknowledge the valuable contributions of Louisa Sangalakula and Sharon Baruch-Mordo, the latter who despite challenging personal and professional circumstances, as well as a full workload participated in many virtual sessions and provided to the extent possible, responses to our queries and persistent requests for supplementary documentation throughout the review process; all this with a positive outlook and a smile.

Special mention must be made of TRAFFIC's former Elephant and Rhino Programme Leader Tom Milliken, who gave unstintingly of his time to help track down answers to, or point us in the right direction for, every question we asked and to discuss the points we took every opportunity to raise and attempted to the best of his ability to stand in for TRAFFIC's statisticians when it was not possible to engage with them. We are also grateful to current and former members of the MIKE-ETIS Technical Advisory Group and MIKE-ETIS Subgroup, including Dr. Holly Dublin and Basile van Havre among others, for the open and frank exchanges. The Governance and Business Process Specialist is also grateful to Sharon Creasey for her editing assistance on this report.

Finally, the review team is grateful for the inputs received from a select number of CITES National Management Authorities, who were willing to contribute their thoughts and participate in the review process, including Belgium, Canada, People's Republic of China, Gabon, Kenya, Malaysia, Mozambique, Nigeria, Singapore, South Africa, Tanzania, Thailand, Togo, Uganda, Vietnam and Zimbabwe.

The review is intended to take stock of what has been achieved by ETIS over its more than twenty-years of operations, as well as glean some of the critical lessons that can be learned from it. In this report, we have tried to offer pragmatic recommendations and constructive criticism where we think it is warranted and sincerely hope that those involved take it as such.

We wish the entire ETIS and CITES Secretariat teams every success in their continued commitment to curtailing the global illegal ivory trade and further growing ETIS as an indispensable tool in informing global decisions affecting elephant conservation.

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Executive Summary

Overview and Structure of the Report

1. This Executive Summary has been drafted by the Governance and Business Process Specialist, with input from the Data Management and Statistical Analysis Specialist (henceforth used interchangeably with "the consultants" and "ETIS review team"). It is intended to pull together the main findings and observations, recommendations and conclusions of the ETIS review at a high-level, the details of which are presented in subsequent sections of this report.

2. Per the Terms of Reference, and consistent with the Inception Report detailing the methodology and approach of the ETIS review, the Governance and Business Process Specialist incorporated the statistical report produced by the Data Management and Statistical Analysis Specialist, on the technical aspects of the analytical framework of the ETIS programme. For reference, the statistical report has been appended in its entirety in Annex M.

Purpose and Scope of the Review

3. The ETIS programme review was recommended by the CITES Standing Committee. Its associated ToR (Ref. Annex A) was formally adopted at the 70th meeting of the Standing Committee (SC70, Sochi, October 2018) (**Ref.** SC70 SR and SC70 Com.15). Subsequently, at CoP18, Parties adopted Decisions 18.18 - 18.20 with further instructions relating to this review.

4. Pursuant to Decisions 18.19 and 18.20, Parties directed the Secretariat to take stock of any recommendations emanating from this review and report back to the Standing Committee at its 73rd meeting (SC73) that subsequently will review the findings and recommendations therein to make recommendations for consideration at the 19th meeting of the Conference the Parties (CoP19). However, due to the COVID-19 pandemic, SC73 was postponed and held online. The reduced agenda for SC73 did not contain the ETIS review, which may be addressed at the 74th meeting of the Standing Committee, to be held prior to CoP19.

5. Also of note is Decision 18.21 calling upon the Secretariat to develop proposals for consideration by the Standing Committee, on possible approaches to address the financial and operational sustainability of the MIKE and ETIS programmes.

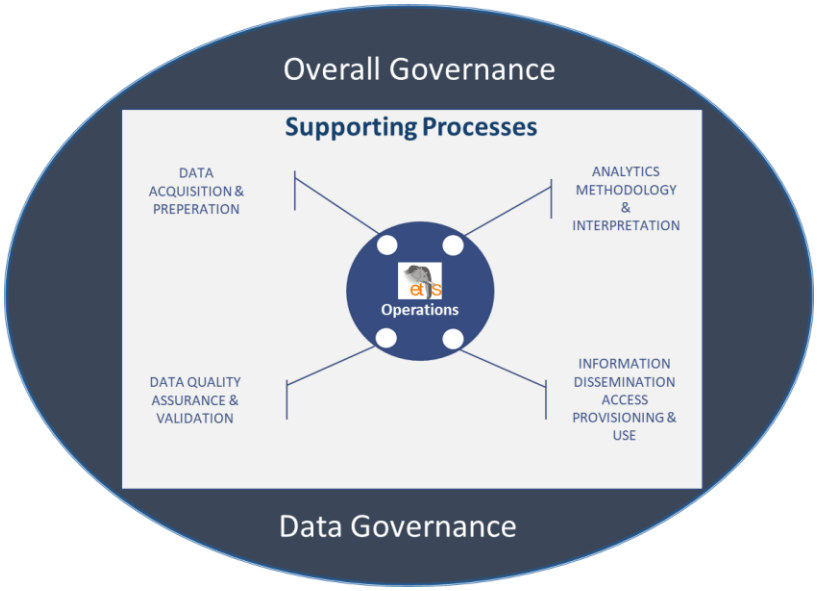
6. Since its inception ETIS has not undergone a formal "end-to-end" evaluation. Only some incremental refinements and revisions to the database structure, statistical model, bias adjustments, ETIS 'R' code-base, and analytical reporting to CITES on illegal trade in ivory, have been undertaken.

7. Recognizing the importance of greater efficiency, stronger synergies with other programmes (including to the best extent possible linkages with MIKE) and the need to reduce duplication of efforts to serve CITES Parties more effectively, the review addresses three main questions:
    a. Is ETIS operating in an appropriate, transparent, and accountable manner?
    b. Are CITES Parties engaged as appropriate?
    c. Does ETIS produce scientifically robust analyses to be used in CITES decision making processes in accordance with the provisions in Resolution Conf. 10.10 (Rev. CoP18)?

Review Methodology and Approaches

8. This report addresses ETIS-related review requirements and concerns under three pillars:
    - Overall governance, information governance, supporting processes, and ETIS sustainability;
    - Data management (including data acquisition and preparation), data quality management and validation, information dissemination, control, and use;
    - Analytics methodology, supporting programing code, and analytics interpretation.

Figure 1: Overall Governance Construct



9. The consultants conducted the review using a participatory and utilization-focused approach, based on the questions provided in the ToR, by an evaluation matrix organized under a subset of UNEP's evaluation criteria: strategic relevance, effectiveness, efficiency, sustainability and impact. This matrix (see Table 6) outlines the main evaluation questions and data sources.

10. The review was executed across four methodological phases: (a) inception stage and preliminary document review, (b) current state / fact finding stage, including virtual consultations, (c) future state definition stage, including options analysis and gap analysis, and (d) reporting.

11. It also used a mixed-methods approach to collect and triangulate data from different sources, including a documentation review, semi-structured interviews, direct observation and hands-on review of the code. This approach supported the development of robust and evidence-based findings, which in turn allowed for the development of insightful, validated conclusions, and forward-looking recommendations.

12. The consultants reviewed more than 70 documents, publications, presentations, CoP Resolutions and reports provided to them at the outset of the assignment, analyzing them and systematically parsing information related to the evaluation questions. Many more documents were collected, read and discussed over the course of the ETIS review.

13. Between 25 June 2020 and 24 November 2020, the consultants conducted 41 online interviews with over 50 people to gather data, including 9 interviews with staff members of the CITES Secretariat,

11 with current TRAFFIC staff, 2 with former TRAFFIC staff, 3 with members of the Technical Advisory Group (TAG), 1 with the former Chair of the MIKE-ETIS Subgroup and finally, extensive consultations with 15 Parties.

14. The ETIS review team encountered a number of challenges and setbacks while conducting data collection that were principally related to the availability of key stakeholders at critical junctures due to the COVID-19 pandemic. Other delays in the receipt of requested documentation occurred as a result of the review coinciding with an intense period of preparation for the launch of ETIS Online, and the Data Management and Statistical Analysis Specialist encountered issues while running the code provided to Parties on GitHub (also faced by a member of the TAG). The above contributed to an extended timeline for the ETIS review, which was further compounded by a lengthy review cycle lasting more than six months as opposed to the three weeks envisaged and articulated in the Inception Report.

Key Issues, Observations and Findings - ETIS' Current Operational and Governance Approach

15. The key issues, observations and findings noted below are supported by detailed findings in Section Four of this report. Reference is also made to the graphic in Annex B presenting "ETIS in a Nutshell"[1].

Governance

16. Based on the key pillars of the ETIS programme's governance construct (see Figure 1 above and Section Four for detailed findings), as well as the totality of the documentation reviewed, including Standing Committee communications and official correspondence by Parties (and responses therein), as well as stakeholder consultations held, the decision-making processes have been found to be effective, highly participatory, and founded on consensus building; the trade-off being that its overall efficiency and responsiveness is somewhat hindered and not "lean". Generally, accountability is well-defined, and responsibilities are followed but not consistently, mostly due to lack of capacity.

17. While there is the perception, that transparency can be improved, the CITES Secretariat and TRAFFIC have been forthright with providing all relevant information related to the operational and governance aspects of ETIS. The Parties' requests for information, explanation and further elaboration are addressed diligently and at length. Time-lag in response to Parties' concerns is reasonable considering capacity constraints and competing priorities in supporting other CITES activities and statements of work by TRAFFIC.

18. In the absence of clearly defined Key Performance Indicators, the outcomes of the ETIS programme are assessed by proxy through the lens of its reports to CoPs, the resulting decisions and recommendations by Parties and the extent to which these have been implemented, as well as key technical documentation, parallel informal technical reviews conducted by members of the TAG and stakeholder consultations. From a process perspective, as the foundational system to provide the data and analytics required in support of the National Ivory Action Plan (NIAP) compliance mechanism, ETIS performs well based on the data available, however the NIAP process should also be explicitly and consistently informed by interactions with and consultations with other agencies

[1] Content drafted by Thea Carroll (CITES MIKE Coordinator) and validated and redrawn by Camillo Ponziani (Governance and Business Process Specialist),

and experts, as reflected in Annex 3, Step 1 (b) in Resolution 10.10 (Rev. CoP18) on Trade in elephant specimens.

19. Some Parties do have concerns with an NGO managing and coordinating ETIS since it also plays an advocacy role in its programming, which may introduce implied biases in its supporting activities under ETIS. There is no doubt, however, that TRAFFIC is committed to the conservation of elephant populations, curtailing illegal trade of ivory and other specimens, and to biodiversity conservation in general. The overall analysis is data-driven and quantitative at its core. Furthermore, the data analysis is supported by in-depth knowledge of the domain and associated qualitative information. Upon reviewing all the available documentation, correspondence (including responses to Parties' concerns), and an extensive number of conversations and interviews with TRAFFIC and ETIS stakeholders, and based on the totality of information and data digested as part of the review, the consultants find TRAFFIC to be objective in their use of available data, analytics approach, observations, and recommendations, which is overseen by the TAG and Secretariat.

20. As per its Terms of Reference, Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens directed the Standing Committee to establish a Technical Advisory Group to provide technical oversight to the programme for Monitoring the Illegal Killing of Elephants (MIKE) and the Elephant Trade Information System. To be effective in its oversight role, two of the main subject areas requiring technical expertise on the TAG to advise on ETIS matters are statistical analysis and illegal wildlife trade. To fulfill the statistical analysis subject area, two seasoned veterans were appointed to the TAG as statisticians to address the need for analytics and statistical oversight. Moreover, to ensure further coverage of the other domain, the CITES Secretariat in consultation with TRAFFIC will be nominating illegal wildlife trade experts as global members to the TAG for consideration by the Standing Committee. The TAG should instill confidence in the Parties by ensuring that all the reports and analytics outputs are being reviewed and validated by an independent group. This person would provide the expertise in place of the former ETIS Director (Mr. Tom Milliken) who has retired and is no longer with TRAFFIC. Meanwhile, TRAFFIC's new in-house analyst, Ms. Sharon Baruch-Mordo, brings statistical expertise in the wildlife domain and over time, can fill the role that the previous ETIS Director had.

Supporting Processes

21. From a business process perspective, the ETIS review has been somewhat of a moving target as there are already important changes introduced or well underway that will address concerns raised by Parties relating to supporting processes, and further developments during the report's long review cycle that may not be fully captured herein[2]. The recently launched ETIS Online platform includes features that will make the submission and validation of data by Parties much more robust, especially in relation to validation of the countries implicated in a seizure recorded by the country of 'Discovery' (country reporting the seizure). In this case, the process has been enhanced through automation. Further detail is outlined in Section Four.

22. The available technical documentation on ETIS is extensive and comprehensive but is neither organized nor published consistently. Relevant information based on subject area ought to be collated in one singular document. Updates to the supporting documents lag the implementation in some instances and lack proper version control. Knowledge management is paramount in exuding confidence in the supporting processes and how data and information is managed and arrived at.

[2] It is important to note the fact finding stage of the ETIS review ended November 2020 with several material developments, where referenced explicitly, also reflected in this report up until March 2021.

23. Training is one of the key areas that TRAFFIC can improve on going forward. In the past, TRAFFIC has developed publications and presentations. For example, TRAFFIC noted that it produced a modular training package, which was translated into 15-16 languages; from a one-hour PPT to a 3-day workshop that described the end-to-end process and ETIS' data fields for form entry. Nonetheless, more emphasis is needed for both passive (recorded) and active (scheduled and participatory) online / virtual training, especially considering the new release of the ETIS Online.

24. Communication across the board is an area in which the ETIS programme can improve on, and is the hallmark for business process optimization. Targeted, timely, frequent, proactive as well as reactive communication of new and upcoming changes and development, as well as regularly reiterating key concepts and processes is crucial. As an example, it is not widely understood that TRAFFIC is only tasked to communicate what the data shows, and not as decision-makers, as is clearly outlined in relation to the NIAP process in 'Annex 3' to the Resolution Conf. 10.10 (Rev CoP18) on Trade in elephant specimens. This misunderstanding can undermine confidence in what TRAFFIC is tasked with: leveraging its domain expertise, information, and analytics knowledge to render cause and effect suggestions and observations for the CITES Secretariat to further assess and make recommendations, or constructive corrective action by Parties and stakeholders where appropriate, to manage and combat the illegal ivory trade.

25. Since the CITES Management Authorities (MAs) in some instances have no ivory seizing responsibilities themselves and are not always empowered as a law enforcement body to make seizures, to validate seizures they have to contact customs or police or other law enforcement agency in the country. Leveraging mobile technology to render ETIS Online to the agents on the ground could have the potential to enhance data quality, sense of empowerment by the field officers, and resource utilization efficiencies.

Sustainability

26. Funding inconsistency and uncertainty is an impediment to advancing towards the objectives set forth for ETIS and enhancing ETIS' functionality and ensuring its robustness. Consequently, long-term constructive and logical planning is not feasible; planning is very much short-term and reactive based on what funds are made available for what purpose.

27. Independent and formalized third-party reviews, evaluations and assessments are imperative for continuous improvement of a practice/discipline/program and justification for supporting funds. Approval and funding of this review is a prime example of it. In fact, this review is in response to addressing Parties' concerns and a subsequent request by the Standing Committee.

28. In November 2020, it was conveyed to the consultants by the CITES Secretary General that positioning ETIS under the Outreach and Projects Unit - as part of the organizational realignment thinking at the time - may present new opportunities through collective fundraising to advance financial sustainability by positioning initiatives within similar needs and requirements under a single umbrella. This potential needs to be explored further as provisioning for the minimal funding required to sustain the program is crucial during the next few years.

29. Potential implication of externalities to a programme's sustainability needs to be considered diligently from a risk management perspective. One of these risks has already materialized in the COVID-19 pandemic. This event has not only caused historic setbacks in global health but has triggered a series of degenerative ripple effects, such as political mandate and priority, economical condition, and social discourse to name a few, all of which will have implications in sustaining this program and prioritizing the minimal funding required for day-to-day operations. The consequences need to be considered systematically towards prioritizing activities and resource allocation.

30. Deep understanding of illegal/legal wildlife trade is crucial and the former ETIS Director was instrumental in providing subject matter expertise. Furthermore, the relationships built with Parties over decades have been paramount in promoting open dialogue and enhanced cooperation; hence critical for the sustainability of the ETIS program. The gap created by his retirement could potentially create a significant gap going forward, if not managed carefully.

Data Governance

31. ETIS is a data-centric system; an established data governance practice is fundamental in outlining data policies and a decision framework for managing the data. Data governance has not been defined nor referenced in any of the documents reviewed. A well-established data governance regime instills confidence in the data management practices by custodians of their data, TRAFFIC and CITES Secretariat, the data stewards.

32. Paragraph 27 (g) of Resolution Conf. 10.10 (Rev CoP18) on Trade in elephant specimens outlines data ownership as: "*…the detailed data on individual seizure cases, elephant mortalities and law enforcement submitted to MIKE or ETIS are owned by the respective data providers, which in most case are the CITES Parties; any such data relating to a CITES Party will be accessible to that Party and the members of the MIKE and ETIS Technical Advisory Group for information and review purposes, but will not be released to any third party without the consent of the Party concerned; data may also be released to contractors (e.g. statisticians) or other researchers (e.g. MIKE ETIS Subgroup-approved research collaborations) under appropriate nondisclosure agreements;…*". Moreover, any changes to the data elements associated with a submitted record needs to be confirmed with the Party before it is considered the official version of the record. The review finds that TRAFFIC follows up with an official body to validate the data as required.

33. Currently, ETIS data cannot be shared with other entities such as UNODC, the UN entity that currently conduct the illegal trade review. Data sharing policies as well as provisions relating to access to data contained in relevant Resolutions need to be refined to take advantage of potential synergies in leveraging the knowledge and experience of other established and trusted agencies such as UNODC where appropriate.

34. Relevant seizure data shared by other NGO's are leveraged by TRAFFIC where appropriate. If there is any discrepancy between the data received and official government agency data, the latter is taken. Although in some cases, TRAFFIC would follow up with the government agency to reconcile. If cases are validated by government agencies, the seizure data will be recorded as the official data in ETIS.

35. ETIS Online does not capture sensitive Personally Identifiable Information (PII) such as name of offender, however non-sensitive PII such as nationality of the offender is captured. Even though TRAFFIC is prohibited from sharing the data with other agencies such as NGOs, any data-centric system warrants a well-informed privacy policy that explicitly lists all the sensitive and non-sensitive information being captured and/or utilized.

Data Management

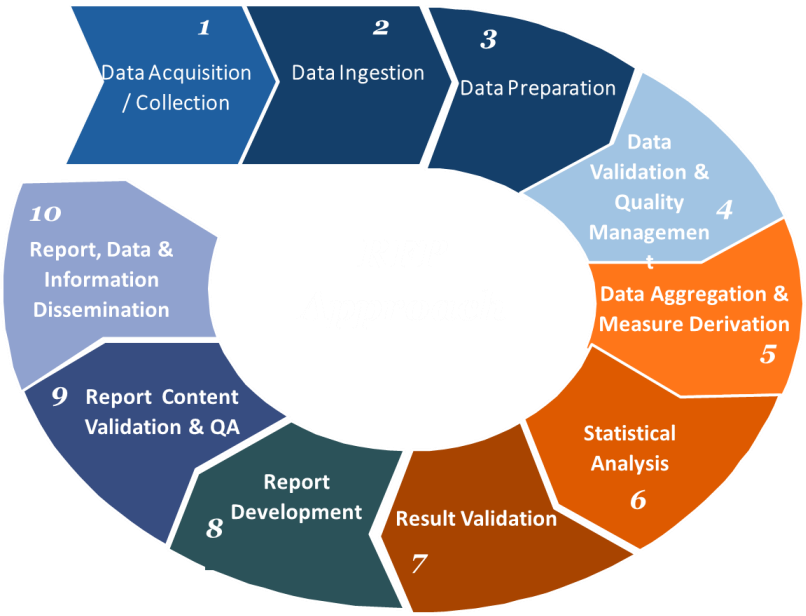
Data Acquisition and Preparation:

36. ETIS data and information can be classified into the following:
    - Seizure records;
    - Subsidiary (complementary) data;

- Derived variables and measures and analytics outputs (trend lines and charts);
- Supporting information: Audit logs, all related documentation (i.e., standard operating procedures (SoP), publications, formal correspondence, training artifacts, etc.), and all other information.

37. The ETIS data lifecycle is depicted in Figure 2 below. The initial data lifecycle process is the data acquisition and collection. Seizure records are collected and captured through several mediums that include, online forms, seizure record batch upload Excel templates, and all other format and forms of hard/soft copy submissions which are entered in ETIS by TRAFFIC. Current record submissions use ETIS Online (since its launch) to enter each record through the interactive forms, or an Excel template batch upload. Online submission is the most effective method since it enforces ETIS's online field-level edit and validation rules, and is the method being promoted by the CITES Secretariat and TRAFFIC as best practice. It is expected that ETIS Online will become the prominent medium and mechanism for seizure record submission by Parties. As of March 2021, despite multiple efforts by TRAFFIC encouraging data submission on the portal, the uptake has not been significant. Internalization and utilization of ETIS Online needs to be encouraged and promoted.

Figure 2: ETIS Data Lifecycle



38. Subsidiary data are acquired by TRAFFIC, such as Transparency International for 'Corruption Perception Index (CPI)', or they are derived measures such as 'Mean Market Score' that are based on data acquired by TRAFFIC through market surveys, NGOs and other viable sources. This dataset is leveraged either directly in statistical modelling, or indirectly as complimentary data and information to explain the output from the cluster analysis. Both these uses are appropriate and significant in supporting the illegal ivory trade analysis with its sparse and small seizure dataset. However, since the source and usage of this dataset is of concern to Parties, the TAG should play a more active role in ensuring the applicability and appropriateness of the subsidiary data, and a more comprehensive, in depth and clearer explanation of the subsidiary data used by TRAFFIC needs to be provided to the Parties, including access to the subsidiary data.

39. Once data is captured through ETIS and stored in the ETIS database, it is prepared before it is used in the analytics phase by applying data quality management, enrichment, and transformation rules. Downstream in the data life cycle, upon data capture, data quality, credibility and richness

deficiencies are addressed by the application of the statistical methodology, the Bayesian Hierarchical model. Data preparation is time consuming and when provisioning for this activity TRAFFIC follows right practices. Of course, there is always room for improvement, but like any data management processes, once the appropriate process maturity level is reached, the incremental value extracted versus time and resources allocated may not be justified, considering resource and funding constraints.

Data Quality Management and Validation:

40. The effectiveness of analytics and the credibility of its results are directly dependent on the quality of the data used. Data quality management is applied throughout the data lifecycle. The most significant application of data quality management protocols is at the front end of the data life cycle, over the data acquisition and database system ingestion, where most of the effort needs to be focused.

41. The first data quality provisioning in the data lifecycle is addressed during data ingestion in ETIS, the field level data validation rules such as list-based selection, data type edit rules, and multi-field complex rules. Subsequently, there are a number (19) of more complex, stand-alone executable 'R' scripts rules that can be executed on-demand by the ETIS System Administrator to identify anomalies. If a data quality issue is validated by executing a particular rule, then the appropriate action is taken by the System Administrator to resolve the problem. These set of rules are comprehensive and provide the correct level of data quality management before data is used for the analytics phase.

42. Information and data are validated further down the data lifecycle to validate the output from the analytics phase and the final reporting phase. The validation in these phases is contextual vs the earlier validations which were more mechanical.

Database and System Management:

43. The current system change management and release management practices of ETIS should be more robust and formal. As best practice, request for changes from all stakeholders should be logged and assigned with a suggested level of 'importance'. The change request list ought to be reviewed annually with the TAG before it goes through the MIKE-ETIS Subgroup, who should then make recommendations on the system change implementation priorities for the subsequent year, taking into account the funding envelope available. The plan for the implementation of system changes, including its timeline, needs to be communicated with all the stakeholders. The changes to be implemented that year should be treated as a single release to be developed, tested, supporting documents updated, and training materials produced as required by TRAFFIC. The review team recognizes the funding and capacity constraints and recommends that the required provisions be followed on a "best effort" basis, to be acknowledged by CITES Secretariat and TRAFFIC.

44. ETIS provides a comprehensive audit log functionality. Any action (CRUD: create, read, update, delete) on the data is recorded both at the system level by the Database Management System (DBMS) and application level with reporting functionality.

45. Keeping database snapshots are useful for purposes such as audits, reporting and period-over-period analyses. The ETIS support team creates frequent snapshot of the ETIS Database as best practice. Moreover, each version of a published report is based on a snapshot of the ETIS Database on which the associated analytics is based. This practice enables regeneration of the same results

when the code-base for a reporting cycle is re-run against the associated database snapshot by another stakeholder.

Information and Data Dissemination and Access Control:

46. User access provisioning is a manual and resource-intensive process and needs to be accounted for. The CITES Secretariat needs to establish the capacity required within the organization to assist with access provisioning tasks which are now completely managed by TRAFFIC. TRAFFIC would need to discuss the specifics of access control workflow with CITES Secretariat to determine the appropriate division of responsibilities.

47. Parties have access to the analytics 'R' code-base but not the detailed data required to execute the 'R' scripts. At best, the Parties can go through the code one line at a time and, in conjunction with associated annotation, try to understand how the data preparation and statistical modelling is implemented. The Standing Committee should consider recommending that Parties provide access to all the data to enable the execution of the posted analytics 'R' code-base.

48. ETIS needs to have a formally communicated data sharing policy to be addressed under data governance. Data sharing agreements need to be aligned with this policy. An example of a data sharing agreement is an MOU that has been negotiated by TRAFFIC in conjunction with the CITES Secretariat and the World Customs Organization that calls for an annual data exchange for seizures. The data from the World Customs Organization is a subset of the ETIS data because some seizures are made by the police and some are made by wildlife officials in the national parks. TRAFFIC can isolate all seizures made by customs authorities on an annual basis and share it with World Customs Organisation (WCO).

49. With reference to CoP18 Doc. 69.1 Addendum, there is an annual illegal wildlife trade report which includes illegal ivory trade that has an overlap with the ETIS report, causing potential issues with duplicate reporting as noted in one documented instance involving Turkey. While interviewing selected MAs and CITES Secretariat staff, this concern was not raised as a major issue. In its forthcoming proposal to the Standing Committee, the CITES Secretariat can consider proposing amendments to the data access provisions in the relevant Resolutions, i.e., Res Conf. 10.10 (Rev. CoP18) and Res Conf. 11.17 (Rev. CoP18) to facilitate data sharing to address this concern. This could facilitate an automated or manual reconciliation between ETIS data and the annual illegal trade data. In parallel, the CITES Secretariat can issue guidance to ensure that the responsible MA in each country enters and reconciles the entries for both reports as some do already. The submission deadlines for the two reports are different, March 31 for ETIS and October 31 for the annual illegal trade report, therefore, the reconciliation needs to consider 'date of seizure' as a key attribute for reconciliation. Parties can also consider aligning the reporting dates - both 31 October - recognizing this may have an impact on the ETIS analysis and the ability to produce regular reports as data will only be received 7 months later each year.

50. Based on the current established process, the report is first reviewed by the TAG, then submitted to the Secretariat in accordance with SC/CoP document submission deadlines (90 or 150 days prior, respectively). During that time, Parties have a chance to comment on the report to the CITES Secretariat. A recurring thread noted by Parties consulted during the ETIS review, is anecdotal evidence of Parties being blindsided immediately prior to a Standing Committee meeting, specifically in relation to the scenario where the Party is implicated. The launch of ETIS Online adds a new layer of transparency as detailed country reports and data are now accessible online, including any records in which the Parties were implicated.

Analytics - Methodology:

51. For the average CITES MA and non-expert, there is inherent difficulty in understanding the underpinnings of the statistical methodology. The statistical model is unique and hence not inducive to understanding and comprehension. There was no similar analytics developed in any other equivalent analysis of illegal wildlife trade data, hence the whole approach and statistical modeling to account for the various biases is custom-made. Several deliverables have been produced to provide a simplified explanation[3] of how and why the methodology chosen is leveraged.

52. The base methodology has been peer-reviewed and adapted to new information whilst responding to scrutiny. TRAFFIC has not received any negative feedback through formal academic channels on the approach to the statistical modelling[4]. Furthermore, the two TAG statisticians have conducted an informal review of the statistical methodology and have not found major issues[5].

53. The code to prepare, analyze and report the ETIS data is contained in 38 separate 'R' scripts. These were originally developed under the Darwin Initiative project 17-020 in collaboration with the University of Reading over the period 2009 - 2013, and many of them serve as utility scripts for data preparation and model plotting and diagnostics and not published in the scientific publication; instead data aggregates that serve as modeling inputs are provided along with a few modeling scripts. Since then, the ETIS analysis has been revised and the 'R' code adapted over time; a set of R scripts were first published on GitHub on 17 August 2019 which is the R code used to transform the ETIS data into the outputs for the CoP18 report.

54. Since the model does not work well with a small number of seizures, the ETIS analysis does not consider a country experience in isolation but looks at all transactions captured for the analysis. Due to data sparsity, Frequentist and Bayesian Inference methodology are used; they allow inference based on a small sample size. The Model used for weight estimation is Frequentist (linear model). This approach is sound and appropriate for the ETIS use-case.

55. There has been a long-standing discussion within the MIKE-ETIS TAG to incorporate other related data sets[6]. However, it is much more difficult to match the elephant population, and the numbers illegally killed, to illegal ivory entering the market due to the time lapse and hence not feasible.

56. The model is sensitive to the uniform application of the definition for seizure. Discrepancy as to how the Parties define seizure and hence, what data they report on, has been observed.

57. Comprehensive collection of instructions outlining the methodology and supporting scientific/statistical modeling assumptions in one collated document is absent (i.e., single consolidated update of the Standard Operating Procedures). There are a number of sections in the SoP that provide explanation on various aspect of the methodology and data management processes that can be instrumental in enabling the Parties and all stakeholders to have a better

[3] For example, Understanding ETIS by TRAFFIC provides a useful introduction and overview of the context behind ETIS, and the way in which the analysis is conducted.

[4] As per consultations held during the review this is reflected in "Underwood FM, Burn RW, Milliken T (2013) Dissecting the Illegal Ivory Trade: An Analysis of Ivory Seizures Data. PLoS ONE 8(10): e76539. https://doi.org/10.1371/journal.pone.0076539", one of the most downloaded papers from the statisticians' website.

[5] The informal review by the MIKE-ETIS TAG statisticians in 2019 encouraged the consideration of other methods on how to bias-adjust the ETIS data, using a different selection of covariates or using other methods rather than covariates. In the statisticians' response to the internal review of the ETIS review it was noted that alternative approaches could be considered in the future.

[6] Using the datasets held by the IUCN/SSC African Elephant Specialist Group African Elephant Database (elephant numbers), MIKE (illegal killing) and ETIS (illegal trade) into a single model.

understanding of how data is managed and how the statistical models are executed. In order to make informed decisions, going forward, the TAG should have access to the SoP, the code-base, and all other supporting documents for ETIS.

Analytics - Interpretation:

58. Qualitative analysis is as important as quantitative; however, qualitative is more subjective and requires extensive domain expertise. The former ETIS Director provided the insight required based on his wide-spread knowledge, decades of experience and a strong network that provided insight and information. These are not readily available to his replacement.

59. Input variables into the cluster analysis consist only of outputs from the trend analysis (i.e., transaction and weight index by raw/worked ivory weight classes). Select explanatory variables are leveraged in qualitative analysis for the interpretation of the cluster analysis. These variables are either captured from external sources such as 'Corruption Perception Index (CPI)' or are derived measures from ETIS's base seizure data. Explanation for how and why each variable is used is comprehensive with the exception of the 'Mean Market Score (MMS)' that represents the domestic ivory trade. Consideration of the domestic ivory market is contentious on how the data is obtained, and the calculation of the MMS needs to be further explained. For further detail on the CPI and Mean Market Score, please refer to Section 6 of the statistical report appended in Annex M.

60. Dependency on an ivory market survey is problematic as a number of Parties are not clear on the significance of it for the analysis. Current documentation and communications associated with it are inadequate and not reflective of its importance and its value in the interpretation.

61. The ETIS methodology, as all mathematical and statistical methodologies, has some limitations that should be clearly explained to Parties. This includes the implications of making assumptions and in particular assuming that the data are biased; limitations associated with interpolation and modelling done when there are gaps in the data (e.g., ivory weights); and the implications of using covariates and the effect of each covariate. Although any statistical model has its own limitations, internal coherence should be respected. In this regard further clarification is required about the reasons why the trends analysis and the cluster analysis are based on bias-adjusted data, but the determination of the categories considered in the NIAP process is informed by non-bias-adjusted data. Furthermore, clarification about the similar characteristics considered to group countries into clusters for the cluster analysis is required, as well as more details relating to the sensitivity analysis. These technical aspects should be considered and addressed by the TRAFFIC in consultation with the TAG.

62. It has been noted through the consultations that most Parties are not so concerned about the analytics methodology itself as it is scientific, objective and complicated. They are mainly concerned about the interpretation and ramifications. The CITES Secretariat and the MIKE-ETIS TAG review, validate and suggest amendments as deemed necessary. Since TRAFFIC is the author of the report and will be held accountable to any conclusions drawn, it is prudent that TRAFFIC is maintained as the authoritative source for the final report with ample input from the TAG and undersigned by the Secretariat who are responsible for presenting findings at the CoP.

Factors that Influence the Current Situation of ETIS

Timely and Proactive Communication and Engagement has not been Adequately Emphasized

63. Via the consultation process, an overwhelming number of Parties have expressed a need for adequate lead-time to review the ETIS report findings and assertions in advance of the CoP meetings. This lead time could pay dividends in creating a more efficient and productive atmosphere by allowing the CoP to cover more ground and honing its efforts on discussing broader trends, collective concerns and future plans. It should be noted that if the lead time accommodated for is longer than a few days based on the current schedule, the analysis timeline is implicated and as a consequence, the reports might be out-of-date.

64. The CITES Secretariat and TRAFFIC can improve upon communication, providing updates on all relevant changes that are planned for ETIS and the supporting data and system management processes. Communication needs to be multi-faceted; CITES notifications to Parties, website postings, ETIS Online reminders. Moreover, there needs to be a collective effort by all stakeholders towards timely and proactive communication and engagement.

Stakeholder Accountability is Paramount to Maximize ETIS' Full Potential

65. Institutionalized accountability and responsibility are not carried through consistently by all Parties. ETIS supporting processes and organizational structure assume that all Parties adhere to their mandate for timely, high-quality data submission, which is critical for ETIS analysis to reflect on the most recent trends in illegal ivory trade. The CITES Secretariat and/or Chair of the Sub-group can be more involved and proactive in mitigating the disputes between the Parties and advance its capacity in knowledge and experience of the required subject area, analytics and ivory trade.

Reliable Funding Required

66. Funding has been provided by various stakeholders: from country-specific contributions (e.g., the Netherlands and the People's Republic of China funding this review) to TRAFFIC-engaging entities that have an interest in the preservation of wildlife and specifically elephants, and allocations from the European Union through the MIKE programme. Funding certainty to ensure continuity to support ETIS' day-to-day operations provides the stability required to promote additional financial contributions by the supporting team as well as supplementary contributions from various entities for new initiatives. As an example, other statistical modelling techniques can be tested in parallel for suitability and consideration as an alternative to the current methodology, but it requires a significant funding envelope.

Training and Knowledge Management are Cornerstone of an Enterprise Information Management System

67. Supporting documentation and formal training on how to use ETIS will eliminate any doubts, misunderstandings, unnecessary errors, and problems. User training can help with the implementation of the new release of ETIS Online and ensures maximum efficiency and effectiveness right from the start. TRAFFIC can train ETIS users in a few hours through interactive WebEx/Zoom/MS Teams sessions that would require advance registration. Although as of the end of November 2020 at the cut-off of the fact finding stage, no formal training had been conducted, TRAFFIC did reach out to over 100 Parties to promote the use of data submission using ETIS Online and to offer training. Also to date, TRAFFIC provided one-on-one training sessions with Botswana and Zambia, and a joint training presentation with the Secretariat to the Africa TWIX countries of: Benin, Cameroon, Central African Republic, Congo, Democratic Republic of Congo, Gabon and Rwanda. TRAFFIC has committed in each communication with the Parties as 2020 ETIS data are being collected, to continue to offer training. To this effect, the importance of knowledge management is recognized by TRAFFIC and prioritized accordingly. As with most of the enabling

activities noted in this report, advancement in knowledge management suffers from funding constraints.

Seizure Data Sparsity Requires Data Augmentation to Arrive at a More Credible Result

68. Countries differ in their ability to make and report seizures, and therefore, the seizure rate and rate of reporting can be sparse and not reflective of the actual magnitude of illegal ivory trade. Moreover, the data reported can be incomplete, inconsistent, or requiring augmentation by other relevant and useful data points and information. As such, all available relevant information and data that are statistically tested for significance should be considered in the statistical analysis and interpretation as best practice. This by no means undermines the robustness of the underlying methodology. Moreover, the current and future proxies need to be thoroughly tested and the premise for consideration validated by the broader TAG - not just a subset of this group - prior to the analysis. Statistical modelling has an implied continuous improvement as more data is accumulated, and the relevance of proxy variables used in the past vs new proxies are continuously tested and adjusted for. The justification for and assumptions associated with the use of proxy variables must be clearly communicated to Parties and the TAG must have more oversight in the process to identify relevant proxies.

ETIS was not Envisaged as an Instrument to Drive Compliance

69. Unlike MIKE, ETIS is leveraged to enforce compliance, but the original design was not set out to determine causality[7] nor to be the data-driven instrument to justify compliance activities. The fact that the ETIS analysis is used as the basis for the NIAP process does not incentivize the Parties to report timely or report at all. Contrastingly, certain Parties have leveraged their inclusion in the NIAP process to advance their capacity for law enforcement and combating illegal trade in ivory.

Conclusions

70. The conclusions below are structured per the “Duties and Responsibilities” section of the Terms of Reference to reflect on whether (a) the ETIS programme is operating in an appropriate, transparent and accountable manner; (b) CITES Parties are engaged as appropriate; and (c) ETIS produces scientifically robust analyses to be used in CITES decision making processes in accordance with the provisions in Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens; these are elaborated and discussed further in Section Six. Based on the review findings, recommendations are formulated to:
    (i) further strengthen the methodology used throughout the ETIS process (if required);
    (ii) address the institutional arrangements and resources needed to implement any proposed recommendations to amend the ETIS methodology or Resolution Conf. 10.10 (Rev. CoP18); and
    (iii) deal with the institutional arrangements and resources needed to adequately meet the objectives of ETIS and ensure its longer-term sustainability.

71. In light of the issues, observation and findings noted above, the following conclusions are drawn, which are expanded further in the detailed findings in Section Four.

ETIS Operating Model

[7] ETIS’ impetus and prime motivation was assessing whether or not, and to what extent, observed trends are related to measures concerning elephants and trade in elephant specimens taken under the auspices of CITES; changes in the listing of elephant populations in the CITES Appendices; or the conduct of legal international trade in ivory.

72. TRAFFIC has been the focal point for the ETIS programme operations since its inception due to the significance of ETIS as an enabling data-centric technology and its unique, complex analytics framework as the engine that drives the illegal ivory trade analysis, trend analysis, agglomerative hierarchical cluster analysis, and overall reporting. TRAFFIC operations have been diligent and responsive to the requirements of the CITES Secretariat and the Parties' concerns.

73. The recent reorganization of TRAFFIC to conduct the ETIS analysis internally and institutionalizing the required technical skills in-house offers stability and continuity for TRAFFIC and the ETIS programme. Moreover, the enlistment of two seasoned statisticians and the planned addition, as a member of TAG, of a subject matter expert in the illegal ivory trade in addition to current members' knowledge, expertise and contributions, will provide the complementary expertise required to address the need for a strong advisory group and an independent oversight of the ETIS analytics results, as well as enhance the perceived overall transparency. The TAG has been instrumental in providing support for the ETIS Programme and with the expanded responsibility and dependency outlined as recommended in the report, it would be prudent to revisit/adjust the TAG's ToRs.

74. Accountabilities and responsibilities are well-defined, but both financial and human resource capacity constraints hinder advancing the ETIS programme to realize its full potential. The CITES Secretariat should create a CITES ETIS Focal Point role within the organization to provide an oversight function, to take on a more active role in mitigating the disputes between Parties should these occur, facilitate the reconciliation of elephant specimen seizure information and to report back to the CoP at the end of each reporting cycle. It is acknowledged that the creations of this position will have financial implications. This role can potentially be assigned to current CITES staff member(s)[8] but it will require allocation of adequate time to fulfil the role as well as a good understanding of ETIS, its intricacies and challenges in data management, and knowledge of illegal ivory trade.

75. The long-term servicing of the online ETIS database facility for the CITES Parties needs to be adequately supported so that it serves its purpose in a timely and robust manner. This is of paramount importance for the sustainability of the Programme. The existing ETIS development plan of enhancements and functionality for 2021 and subsequent years needs to be reviewed to evaluate what is required for sustainability of the Programme, then updated so that a vision for the next decade of operation is in place.

Stakeholder Engagement

76. The communication and engagement with Parties and all ETIS stakeholders is fluid and enabled through informal channels and formal governance structures, via Standing Committee meetings, the MIKE-ETIS Subgroup and Technical Advisory Group, as well as through the Conference of Parties and Notifications. What is absent from this equation, however, is the formal and targeted engagement at the most contentious junctures of the ETIS Data Management Lifecycle, including at ETIS seizure record intake and validation.

77. In the context of an ETIS seizure record intake and validation, supporting processes and communication need to be enhanced to ensure sufficient awareness and/or consent by any Party that a record is attributed to, but not the instigator of the seizure, so that it can be fully engaged to

[8] Recognizing any decision regarding internal resource allocation and available capacity is an internal one, the consultants recommend the proposed designated CITES ETIS Focal Point to be someone other than the CITES MIKE Coordinator. The consultants have determined the capacity required for the CITES Secretariat to support ETIS based on recommendations outlined in Table 2, would require a dedicated resource.

assess and confirm the assignment. Furthermore, it is imperative that there is a process to justify any change to a record at any given point in time, making sure that this change is done with equal disclosure and consent by the Party in question.

78. Functionality in the recently launched ETIS Online has gone a long way to close these perceived gaps on the change management of seizure records but it needs to be supported by a workflow and be actively brokered. In more contentious circumstances where a Party is implicated by another and there is disagreement over the legitimacy of a seizure record, the entity which brokers a conversation between Parties should be the Chair of the MIKE-ETIS Sub-group and not TRAFFIC.

79. Finally, targeted, timely, frequent, proactive as well as reactive communication of new and upcoming changes and development, through structured release and change management processes, are paramount, and hence funding should be allocated as required. Effective engagement is a natural extension of a robust governance framework and is a critical factor for successful end-to-end operations an organization; it ensures that the organization's systems are aligned to, and support the organization's strategies and mandate, in this case being Paragraph 27 of Resolution 10.10 (Rev CoP18) on Trade in elephant specimens.

Analytics Robustness and Fit-For-Purpose

80. The effectiveness and appropriateness of the ETIS programme is very much dependent on the robustness of its analytics framework. Whilst the analytical methods are robust and yield relatively accurate results, there is always an unsatisfied funding need for further exploratory analysis and testing of other statistical modelling techniques with a view towards enhancing and improving the analytical framework for ETIS, which is primarily funding dependent. In the absence of adequate funding for research and development and given the continuous pressures to process incoming data, these needs (to improve the analytics in ways that could support continuous improvement) are often overlooked or forgotten.

81. Even though ETIS was not built to support compliance processes such as the National Ivory Action Plan (NIAP) Process, it is the only instrument available to CITES that can provide the required analytics output to inform it. The cluster analysis is the foundation and underlying piece of the ETIS report that assists in identifying Parties to participate in the NIAP process. Since domain knowledge is essential to interpret the output from the cluster analysis, there is an inherent perceived subjectivity that is unavoidable; however, the output interpretation has been performed with competency and based on the ETIS Director's extensive tacit knowledge and experience, together with TRAFFIC's statisticians.

82. The analytics framework's main fuel is data. Receiving good data is extremely important in securing good results from the system, i.e. an accurate, timely, and reflection of the illegal trade in elephant ivory with an understanding of the global scale of the trade, key players, the most important pathways of movement and other relevant dynamics. Effort in enhancing timeliness, completeness and accuracy of the seizure data from the Parties is well worthwhile. It is important to note that there is a trade-off between time allotted to ensure data completeness/accuracy and timeliness of the analysis and the outputs/reports produced to support decision-making.

83. Because a primary ETIS consideration is the trade route associated with each seizure case, countries which rarely or never report seizures themselves can become highly implicated in illegal trade based on data of the trade routes of illegal transactions provided by other nations. At the same time, known trade chains of particular seizures can be expanded on the basis of subsequent forensic examination of confiscated ivory specimens to identify the 'countries of origins' through DNA analysis and other methods. Hence, the forensic assessment is important, and its viability and dependability

need to be verified. However, this will only partially address the assignment of 'country of origin', and the identification and credibility of the trade chain should also be scrutinized and requires concerted attention.

84. The table below presents a summary of the ratings assigned by the Governance and Business Process Specialist, who is also an evaluation consultant. Adopting a subset of UNEP evaluation criteria, these ratings reflect the degree to which, in the judgement of the consultant, progress has been made that can ultimately support the achievement of the ETIS' core objectives. It should be noted that the ratings are a key element of the mechanism by which adaptive management can be achieved. They also provide a measure of accountability and confidence to Parties. This is part of the feedback loop by which information is gathered that can guide decision-making.

85. All in all, ETIS, notwithstanding challenges over the years, has been successful and has realized critical impacts that contribute to the conservation status of the African Elephant (*Loxodonta africana*)[9] and has had a positive impact on reducing illegal trade in ivory. The overall assessment is that ETIS' overall performance can be rated as "Satisfactory" based on the following assessed criteria. These are elaborated on in Section Five.

Table 1: Summary of Ratings	
Criterion	***Overall Rating[10]***
A. Strategic Relevance	**Highly satisfactory**
B. Effectiveness	**Satisfactory**
C. Efficiency	**Satisfactory**
D. Sustainability	**Moderately Likely**
E. Impact	**Satisfactory**
Overall review rating	**Satisfactory**

Recommendations

86. In the context of the most recent state of ETIS (December 2020), associated processes and governance, and assumed contextual limitations, the review offers the following itemized list of recommendations, with additional details for each provided in Section Six of this report and further detail and sub-recommendations in the main body of the report, as well as futher complimentary recommendations for consideration from the Data Management and Statistical Analysis Specialist that includes technical aspects to be considered by the TAG provided in Annex L:

[9] Prior to 25 March 2021, African elephants were treated as a single species, listed as Vulnerable. The latest IUCN Red List recognizes two species (forest and savannah elephants ADD Sc names) following the emergence of new genetic evidence. See: https://www.iucn.org/news/species/202103/african-elephant-species-now-endangered-and-critically-endangered-iucn-red-list In case CITES were to adopt new taxonomy recognizing two African elephants species, this may have consequences for ETIS reporting by Parties, subsequent analyses of data and decision-making.

[10] The individual rating scale used for the criteria of Strategic Relevance, Effectiveness, Efficiency and Impact is consistent with UNEP guidelines as follows: Highly satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory and Highly Unsatisfactory. Similarly, the ratings used for the assessment of sustainability are also consistent with UNEP guidelines as follows: Highly Likely, Likely, Moderately Likely, Moderately Unlikely, Unlikely and Highly Unlikely.

Table 2: High-Level Itemized List of Recommendations			
No.	**Recommended Actions**	**Responsible Party**	**Anticipated Timeframe[11]**
Governance			
1	Augment Annex 1 to include 'Data Governance' and introduce other minor refinements	CITES Secretariat	TBD
2	CITES Secretariat to take on a more proactive role in helping TRAFFIC with data acquisition and as the mediator for concerns and issues raised by the Parties pertaining to data integrity, to facilitate timely data collection.	CITES Secretariat	Short term ASAP, in anticipation of upcoming CoP19, subject to availability of resources
3	Currently there is no defined formal "ETIS team" within CITES; although there is an informal support network of CITES resources that do play a role at different junctures such as overseeing TRAFFIC contractual obligations and supporting CoP reporting during Plenary. At minimum, it is recommended to establish a 'CITES ETIS Focal Point' role to work closely with TRAFFIC and MIKE-ETIS TAG, to orchestrate content reviews (and approvals) between different governance structures and processes, to address Parties' procedural/data disputes, and to aid in ETIS data collection from the Parties. This role can be assigned to current staff member(s) and does not necessarily need a new headcount.	CITES Secretariat	Short term ASAP, subject to availability of resources
4	TRAFFIC should continue to practice objectivity to avoid the appearance of bias pertaining to the ETIS programme. It is also recommended that TRAFFIC coordinates with the CITES Secretariat (i.e., on official media releases) on external communications pertaining to ETIS.	TRAFFIC	Short term ASAP, in anticipation of upcoming CoP19
Supporting Processes			
5	Define clear process (system + workflow) for confirmation and validation of Parties that are implicated in the trade chain respectively	TRAFFIC & Review Team Assistance	Short term
6	Frequently scheduled (quarterly), regimented, real-time training sessions that are recorded and posted covering ETIS Online, data management, and analytics, with pre-defined agenda based on feedback from Parties, complimented by a bi-annual newsletter	TRAFFIC	Short term
7	Streamline and consolidate existing SoPs & methodology documentation for TRAFFIC's internal use and operations, and a refined version suitable for online publication outlining detail procedures and assumptions	TRAFFIC	Short term Internal SoP online SoP: Subject to the

[11] Short term: up to one year, depending on available funding;
Medium term: three years (one CoP cycles), depending on available funding;
Long term: up to six years (two CoP cycles), depending on available funding.

Table 2: High-Level Itemized List of Recommendations

No.	Recommended Actions	Responsible Party	Anticipated Timeframe[11]
			availability of funding
8	Incorporation of ETIS Online notification-enabling data validation/confirmation workflow	TRAFFIC	Complete
9	Emphasize advance distribution of the reports to the Parties to give them time and opportunity to understand the findings, get clarification on their concerns, if any, and to receive feedback on what is being repaired/proposed before the standing committee and CoP meetings. To ensure clarity and confirmation, a supporting SoP needs to be developed (i.e., to set out the processes to be followed to engage implicated Parties and facilitate engagement)	TRAFFIC & CITES Secretariat	Short term, subject to the availability of funding
10	Mobile enablement of ETIS Online to improve data quality through facilities like form-level validation rules while working offline, enabling Parties law enforcement staff to record seizures in remote field locations	TRAFFIC (Significant system change required)	Medium term Subject to the availability of funding
11	Annual illegal trade report and ETIS report automated or manual reconciliation of data relating to elephant specimens and in parallel ensure that the responsible CITES Management Authority in each country enters and reconciles the data for elephant specimens for both reports. It is also recommended to make changes to Res Conf. 10.10 (Rev. CoP18) and Res Conf. 11.17 (Rev. CoP18) on National reports, in line with the proposed amendments in Annex N.	CITES Secretariat (in collaboration with UNODC)	Short term Subject to the availability of funding
12	Consider a robust forensic assessment, through DNA analysis and other methods, is important in the context of establishing the trade chain, and its viability and dependability need to be tested and verified	The Parties in consultation with TRAFFIC & CITES Secretariat	Medium term Subject to the availability of funding
Sustainability			
13	From a resource and knowledge/expertise perspective, leverage synergies with other UN and global agencies	CITES Secretariat	TBD
14	Independent research initiative to analyse and investigate alternative statistical models and techniques with the view towards enhancing and improving the analytical framework for ETIS and/or explore 'crowdsourcing' options for research into assessment of alternative	TRAFFIC / CITES Secretariat	TBD

Table 2: High-Level Itemized List of Recommendations

No.	Recommended Actions	Responsible Party	Anticipated Timeframe[11]
	statistical modelling (Access to the detailed seizure data is a pre-requisite to enable this)[12]		
15	With the expanded responsibility for TAG and dependency outlined in this report, it would be prudent to revisit/adjust the TAG's ToRs and reasonable financial provisioning (i.e., 1-2 members to participate in CoP and SC)	CITES Secretariat	Short term
16	Feasibility assessment to evaluate effectiveness/efficiency of alternative supporting mechanisms for ETIS (i.e. UNODC or CITES Secretariat supporting ETIS in place of TRAFFIC)	CITES Secretariat	Medium term, subject to the availability of funding
17	With respect to the provision of financial resources to meet **minimum requirements** of ETIS to "keep the lights on"[13], Parties should be made aware of the implications of insufficient resources on core operations. A dedicated budget to cover these minimum requirements is required.	CITES Secretariat and CITES Parties	Short term
18	For **any enhancements / improvements moving forward** there are two main requirements: i) change requests should be logged, costed and prioritized by the TAG and subsequently vetted by the Standing Committee to ensure the availability of funding, and upon approval, formal communication of planned changes to all ETIS stakeholders. Recognizing funding and capacity constraints, this should be undertaken on a "best effort" basis; ii) for the provisioning of additional funds for any improvements or enhancements for which there is insufficient funding, more emphasis should be placed on the private sector and philanthropic contributions. Moreover, to alleviate legal obstacles for the receipt of private sector contributions, a legal expert should be asked to propose (and set up) an appropriate legal framework for establishing an appropriate international fund; For **minimum funding requirements,** the following should be implemented: iii) a dedicated marketing campaign for ETIS, targeting the private sector (including technology firms) but leveraging messaging	CITES Secretariat with support from TRAFFIC	Medium term By CoP20 subject to the availability of funding

[12] Crowdsourcing is a sourcing model in which individuals or organizations obtain goods and service, including ideas, micro-tasks and finances, from a large, relatively open and often rapidly evolving group of participants. Currently, crowdsourcing typically involves using the internet to attract and divide work such as research projects between participants to achieve a cumulative result.

[13] To keep the lights on (i.e. continue supporting ETIS infrastructure and seizure data collection and cyclic analytics and reporting activity, without any further enhancements) there is a need for approximately USD 220k – 300k per annum, bearing in mind that CoP years are slightly more resource intensive. There is currently an estimated USD 200k shortfall in the budget for the 2020 - 2023 cycle.

Table 2: High-Level Itemized List of Recommendations			
No.	**Recommended Actions**	**Responsible Party**	**Anticipated Timeframe[11]**
	linked to the illegal killing of elephants (as opposed to illegal ivory trade) should be launched to promote non-traditional sources of funding. iv) An experienced consultant(s) should be recruited for the development and implementation of a Sustainable Financing Framework, resource mobilization, private sector engagement strategy, as well as establishing the required legal frameworks to operationalize preferred options.		
Data Governance			
19	It is recommended to determine the appropriateness of all data elements stored in ETIS database both from a privacy policy and data ownership requirement perspective	TRAFFIC / CITES Secretariat	Short term
20	Inclusion and implementation of data governance principles, policies, and standards	TRAFFIC / CITES Secretariat	Short term
Data Management			
21	Timely seizure data reporting by the Parties is absolutely crucial in order for TRAFFIC to produce quality science-based estimates of trends, hence a more concerted effort for timely submission by ALL the Parties needs to be emphasized and committed to	Parties	Short term Soon after publication & distribution of this report
22	Define a more efficient and effective ETIS user access management process	TRAFFIC / CITES Secretariat	Short term
23	Leverage BI/dashboarding tool such as 'Tableau', 'ActivTrak' or 'Matomo' to present the trends and anomalies dynamically/interactively	TRAFFIC	Medium term Subject to the availability of funding
Analytics Methodology			
24	Greater identification and testing of other covariates that could feature as independent country-specific variables for bias adjustment purposes or as explanatory factors to interpret and understand ETIS results more effectively, accompanied by supporting documentation for communication and reference by stakeholders	TRAFFIC / TAG	Medium term For CoP20 Cycle, subject to the availability of funding
25	Further exploratory analysis with a view towards enhancing and improving the analytical framework for ETIS (in concert with recommendation 26)	TRAFFIC / TAG/ Research Consultancy	Medium term Subject to the availability of funding
26	Streamline the 'R' scripts (+30) to enhance execution performance and minimize hands-on intervention	TRAFFIC	Short term Subject to the availability of funding
27	Per Paragraph 27 of Resolution 10.10 (Rev CoP18) on Trade in elephant specimens, bring to a successful conclusion the exploration and incorporation of overall illegal trade patterns/trends in the overall analysis using the	ETIS/MIKE Supporting Team, CITES Secretariat / TAG / TRAFFIC	Medium term For CoP20 Cycle

Table 2: High-Level Itemized List of Recommendations			
No.	**Recommended Actions**	**Responsible Party**	**Anticipated Timeframe[11]**
	datasets held by the IUCN/SSC African Elephant Specialist Group's African Elephant Database (elephant numbers), MIKE (illegal killing) and ETIS (illegal trade) in a single model		
28	Modelling exploration of the impact of removing lower source grades (B and C) data from trend analyses	TRAFFIC / TAG	Short term Noted as a planned activity for 2021 to be prioritized by TAG Subject to the availability of funding
Analytics Interpretation			
29	Active engagement and involvement of the entire TAG in the overall interpretation and identification and fit-for purpose covariates and proxies before they are considered for the analysis, and refinement and validation of the analytics results and stakeholder communication of this important contribution and oversight	TAG / CITES Secretariat	Short term Immediate
30	Examine the relevance of the ivory price to better understand the economics of illegal trade in ivory and potential for integration with core ETIS activity. TRAFFIC's ivory price dataset can be leveraged as seen fit by TRAFFIC and the TAG	TRAFFIC / TAG	Medium term Subject to the availability of funding
31	Examine the relationship between ivory stockpiles and illegal ivory trade needs.	TRAFFIC / TAG	Medium term For CoP20 Cycle Subject to the availability of funding
32	Thoroughly examine the key drivers and their correlation in terms of elephant poaching and the illegal killing of elephant and illegal ivory trade. This activity can be undertaken in concert with recommendation 27 above	ETIS/ CITES Secretariat / TAG	Medium term Subject to the availability of funding

Consolidated List of Acronyms & Abbreviations

AfESG	African Elephant Specialist Group – IUCN Species Survival Commission
AsESG	Asian Elephant Specialist Group – IUCN Species Survival Commissio
BI	Business Intelligence
BIDS	Bad Ivory Database System
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
(CITES) Parties	Countries that are 'members' of CITES
CoP	CITES Conference of the Parties
CPI	Corruption Perception Index
CRUD	Create, read, update, delete
DAMA DMBOK2	Data Management Association – Data Management Body of Knowledge
DBMS	Database Management System
DG	Data Governance
DM	Data Management
DMBOK	Data Management Body of Knowledge
ETIS	Elephant Trade Information System
GARP	Global Association of Risk Professionals
ICCWC	International Consortium on Combating Wildlife Crime
Interpol	International Criminal Police Organization
IUCN	International Union for Conservation of Nature
KEQ	Key Evaluation Questions
KPIs	Key Performance Indicators
LE Ratio	Law Enforcement Effort Ratio
MA	Management Authoirty
M&E	Monitoring and Evaluation
MEA	Multilateral Environmental Agreement
MIKE	Monitoring the Illegal Killing of Elephants
MMS	Mean Market Score
MOU	Memorandum of Understanding
MRI	Minimum Required Information
NGO	Non-Governmental Organization
PII	Personally Identifiable Information
NIAP	National Ivory Action Plan
OECD-DAC	Organisation for Economic Co-operation and Development - Development Assistance Committee
PCA	Principal Component Analysis
SC	Standing Committee
SoP	Standard operating procedures
TAG	Technical Advisory Group
ToR	Terms of Reference
UN	United Nations
UNEP	United Nations Environment Programme
UNEP-WCMC	United Nations Environment Programme World Conservation Monitoring Centre
UNESC	United Nations Economic and Social Commission
UNODC	United Nations Office on Drugs and Crime
WCA	World Customs Authority
WCO	World Customs Organization

1. Introduction

1.1 The Context

87. Ivory trafficking offences are a complex multi-dimensional phenomenon, often resulting from the interplay of a multitude of factors and can involve a wide variety of actors. To achieve an effective response and monitoring regime, monitoring needs to be addressed via a coordinated approach across the entire illegal trade chain. The complexity inherent to ivory trafficking issues also makes it challenging for governments and international organizations, as well as Multilateral Environmental Agreements, to identify the gaps in, existing monitoring, legislative, administrative, enforcement and preventive systems.[14]

88. In order to monitor and record the levels of illegal trade in ivory and other elephant specimens on a global basis, there is a need for a system to collect and compile robust law enforcement data on seizures and confiscations. At its 10th meeting in 1997 (CoP10), the Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) recognized the Bad Ivory Database System (BIDS) by TRAFFIC for this purpose. Through further development and refinement, BIDS evolved into the Elephant Trade Information System (ETIS), which has been used to monitor the pattern and scale of illegal trade in ivory and other elephant specimens since 1998.

1.2 Background

89. ETIS is a comprehensive and global information system whose central feature is a database containing the details of law enforcement records for seizures and/or confiscations of elephant ivory and other elephant specimens reported since 1989. ETIS also maintains a series of subsidiary information on law enforcement effort and efficiency, rates of reporting, legal and illegal elephant product markets, governance issues, background economic data, and other factors. Analyses of the data collected through ETIS generates information that could be used to inform and guide international ivory trade policy and interventions to protect elephants from poaching and illicit trade. It further assists in identifying high-risk markets associated with illegal elephant ivory trade.

90. The aims and objectives for ETIS are provided in Resolution Conf. 10.10 (Rev. CoP18) on *Trade in elephant specimens*, as revised and agreed at the 18th meeting of the Conference of the Parties to CITES in 2019 (CoP18). In Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens[15], Paragraph 27 (a) under the subheading **'Regarding monitoring of illegal hunting of and trade in elephant specimens**', the following objectives are specified for ETIS:

[14] Wildlife and Forest Crime Analytic Toolkit (2012). International Consortium on Combating Wildlife Crime. UNODC

[15] https://cites.org/sites/default/files/document/E-Res-10-10-R18.pdf

i. measuring and recording levels and trends, and changes in levels and trends, of illegal elephant killing and trade in ivory and other elephant specimens in elephant range States, ivory consumer States and ivory transit States;

ii. assessing whether and to what extent observed trends are related to measures concerning elephants and trade in elephant specimens taken under the auspices of CITES; changes in the listing of elephant populations in the CITES Appendices; or the conduct of legal international trade in ivory;

iii. establishing an information base to support the making of decisions on appropriate management, protection and enforcement needs; and

iv. building capacity in elephant range States and, as applicable, countries involved in trade in elephant specimens, to implement and make use of MIKE and ETIS in managing elephants and enhancing enforcement;

91. ETIS and its supporting processes have been incrementally refined since inception, augmenting data quality and validation processes, incorporating changes to how and which parameters are leveraged in the analytics, and learning from past analyses and the changing landscape of the illegal ivory trade. Facilitating seizure data submission by Parties has been enhanced through the launch of a new online user-friendly interface on 15 October 2020.

92. Subsequent to the 63rd meeting of the Standing Committee (SC63) and the 16th meeting of the Conference of the Parties (CoP16; Bangkok, 2013), the National Ivory Action Plan (NIAP) process was established and introduced as a compliance mechanism under the direction of the Standing Committee to address illegal ivory trade in source, transit and destination countries by strengthening ivory trade controls, supporting law enforcement, and improving awareness.

93. ETIS has served as the enabling system to provide the data and analytics required in support of the NIAP process, and the role of ETIS in this process was formalized at the 17th meeting of the Conference of the Parties (CoP17, Johannesburg, 2016), when the CoP agreed *Guidelines to the National Ivory Action Plans Process*. These guidelines, available in Annex 3 to Resolution Conf. 10.10 (Rev. CoP18) states in Step 1 a) state that “The foundation for identifying Parties to participate in the National Ivory Action Plan (NIAP) Process, is the ETIS report submitted to each meeting of the Conference of the Parties (CoP) under this Resolution”. The analysis of ivory seizure data, presented in the ETIS analysis to each CITES CoP, is therefore the foundation used by the Secretariat to identify Parties that might be included in the NIAP process. The NIAP process is detailed in the Guidelines to the NIAP Process.

1.3 Document Overview

94. This report consists of seven sections. Following this introduction, the second chapter summarizes the purpose, target audience and key areas of inquiry. The third section describes the methodology and data collection tools. Chapter four delves into the findings at a granular level, providing supporting information. Given the CITES Secretariat is administered through UNEP, chapter five positions its findings as ratings

in the context of UNEP's standard evaluation criteria of *strategic relevance*, *effectiveness*, *efficiency*, *sustainability* and *impact*. The sixth section pulls together the findings of review in a series of recommendations, while section seven notes the main conclusions. This report also includes several appendices, which complement the information provided in the main body of this document.

95. It is important to note the fact finding stage of the ETIS review ended November 2020 with several material developments, where referenced explicitly, also reflected in this report up until March 2021.

96. As per the Terms of Reference, and consistent with the Inception Report detailing the methodology and agreed manner in which the ETIS review should be carried out, the Governance and Business Process Specialist leveraged the deliverable produced by the Data Management and Statistical Analysis Specialist, on the technical aspects of the analytical framework of the ETIS programme and recommendations to address any problems identified, to further strengthen the methodology used in the ETIS process and analysis. References to chapters in the report produced by the Data Management and Statistical Analysis Specialist are made in this report as complimentary information and where possible, have been consolidated.

97. The formal recommendations in this report have been refined based on the high-level observations and findings on the subject areas to be addressed that were presented to the CITES Secretary-General and CITES MIKE Coordinator on 29 October 2020 and further refined with a member of the Technical Advisory Group on 05 November 2020. These recommendations have been discussed and jointly agreed between the two consultants, recognizing there may be other recommendations mentioned and conclusions drawn in the Data Management and Statistical Analysis Specialist's individual report that may not be carried over herein. For reference, additional complimentary recommendations are included in Annex L with the statistical report appended in its entirety in Annex M.

1.4 The ETIS Review's Associated Concepts and Definitions Used in the Report

98. ETIS is an information system supported by an analytics framework that intakes data (seizure related and subsidiary data) and produces derived information as measures, trends, and associations. It is imperative to ensure standard, domain specific definitions are articulated for this review's proceedings.

99. Information and data are distinguished based on the following definitions:
    - **Data** can be defined as something that is, or represents, a fact. This can be in many forms (e.g., text, numbers, graphics, sound, video);
    - **Information** is data in context. Context means providing a meaning to the data, defending the format in which the data are presented and the relevance of the data within a certain usage context. Moreover, information is the result of processing, organizing, analysing, and structuring data, and what we present

or report, to provide something meaningful or useful for decision makers about matters of policy, programmes and protection.

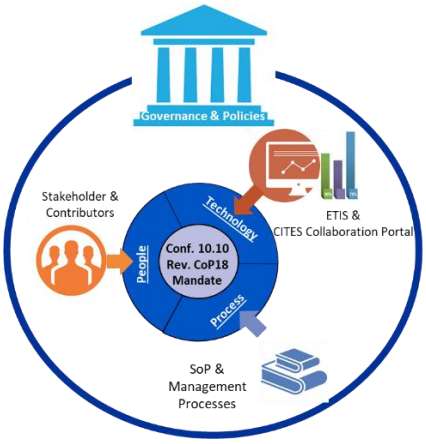
100. Underlying all credible and high-quality information are reliable data. ETIS' data are the facts and figures, both the quantitative and qualitative elements that are gathered and interpreted to create information that inform ETIS stakeholders to manage the illegal ivory trade across the globe. The sections below provide a brief description of the concepts and scope of the subject areas to be addressed.

1.4.1 Governance

101. The United Nations Economic and Social Commission (UNESC) indicates that the eight major characteristics of good governance are that it is: "*participatory, consensus-oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive, and follows established rules*"; while the Global Association of Risk Professionals (GARP) highlights the importance of concepts such as credibility, transparency, and accountability in establishing effective governance. ETIS' programme governance is addressed through these characteristics.

102. Governance direction is set for management capabilities and activities that encompasses people, process and technology through prioritisation and decision-making as depicted in Figure 3 below.

Figure 3: ETIS Governance in Context



1.4.2 Supporting Processes

103. For the purposes of this report, supporting processes are defined as all business processes that refer to a wide range of structured, often chained, activities or tasks conducted by people and/or technology to deliver a service or accomplish a business objective. This sequence of steps can be most clearly depicted using a flowchart or swim lane diagram.

1.4.3 Sustainability

104. Business sustainability is a multi-faceted subject area. This report focuses on sustainability pertaining to the ETIS programme in the following context:

a. Understanding stakeholder value to drive organizational design, strategy, and services;
b. Business continuity of operations systems and supporting processes and their continuous improvement;
c. How to leverage people's capability and skills to improve the programme;
d. Leveraging knowledge and information to determine areas for improvements and/or optimization;
e. Minimum financing required to maintain the system, and financing mechanism to enhance capacity and drive continuous improvement by leveraging knowledge and information gained.

1.4.4 Data Governance

105. DAMA - DMBOK2 (Data Management Association – Data Management Body of Knowledge) defines data governance (DG) as the exercise of authority and control (planning, monitoring, and enforcement) over the management of data assets. Programs and organizations that establish a formal data governance practice exercise authority and control leading into more confidence by owners and consumers of data.

106. Data governance guides other data management functions according to policies and best practices and ensures oversight and accountability by establishing data owners and stewards and defining their associated responsibilities for all ETIS data with transparent and effective communication on all matters relating to data including data integrity, reasonability, timeliness, accuracy, completeness, consistency, accessibility, usability, and validity.

107. Data governance activities include:

- Communicating information strategies, policies, standards, and metrics;
- Tracking and enforcing regulatory compliance and conformance to information policies, standards, and procedures;
- Sponsoring, tracking, and overseeing the delivery and operational execution of information management programmes (i.e., ETIS);
- Providing an understanding, based on stakeholder needs, of the decisions and priorities associated with information resources.

1.4.5 Data and Information Management

108. Data Management is the development, execution, and supervision of plans, policies, programs, and practices that deliver, control, protect, and enhance the value of data and information assets throughout their lifecycles. DAMA-DMBOK2 is a data governance and management best practice framework leveraged across industries. The Figure below outlines all data management knowledge/subject areas defined in DMBOK2.

Figure 4: DAMA-DMBOK2 Data Management Framework - Subject Areas

109. Data management (DM) in context of this report is defined at a more granular level applicable for this review, while considering DMBOK2 subject areas. DM is the process of acquiring, validating, storing, protecting, processing, and disseminating data that is required by CITES Secretariat and ETIS stakeholders so that it is reliable, accessible, and available in a timely and predictable manner.

110. TRAFFIC manages ETIS data to achieve the goals and objectives that have been established in Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens. Deriving value from ETIS data requires lifecycle management. Stages pertaining to ETIS data lifecycle is depicted in Figure 5. Each stage is defined as follow:

(i) **Data acquisition / collection**: data management begins with data acquisition which is the process of collecting data, including what data is acquired, how, and why;

(ii) **Data ingestion:** standard term for the transportation of data from assorted sources to a storage medium where it can be accessed, used, and analyzed by an organization. The destination is typically a data warehouse, data mart, database, or a document store;

(iii) **Data preparation:** is the process of cleaning and transforming raw data prior to processing and analysis;

(iv) **Data validation and quality management:** while data quality management provides a context-specific process for improving the fitness of data that is used for analysis and decision making, data validation is an intrinsic data quality management activity, checking the accuracy and quality of source data before using, importing, or otherwise processing data;

(v) **Data aggregation and measure derivation**: data aggregation is the process of gathering data and presenting it in a summarized format, whilst measure

derivation are variables that are derived by applying rules or calculation on the underlying data;

(vi) **Statistical analysis:** is the science exploring and presenting data to discover underlying patterns and trends;

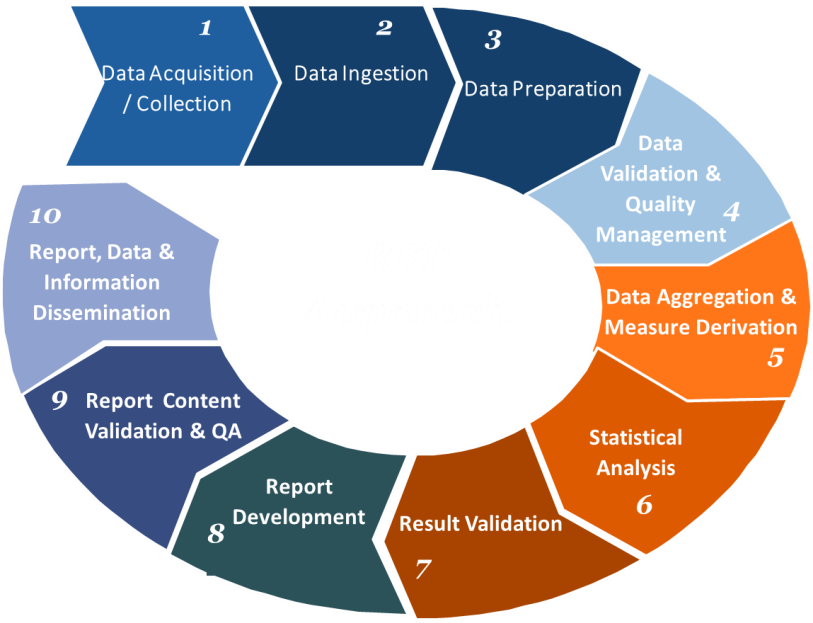
(vii) **Result validation:** is the validation and quality assurance of the statistical analysis output;

(viii) **Report development:** is constructing a narrative in the related business context with supporting graphs and charts to present the statistical analysis results and the associated methodology, techniques, rules, assumptions, and underlying data;

(ix) **Report content validation and quality assurance:** involves review of the report assumptions, assertions and appropriateness of the methodology, technique and underlying data;

(x) **Report, data, and information dissemination:** distribution and publication of underlying data, information generated, and reports produced based on information sharing policy.

Figure 5: ETIS Data Lifecycle



1.5 Recent Activities to Improve Data and Information Management

111. Since the publication of the related ToRs for this review, CITES Secretariat and TRAFFIC have implemented several changes and closed a number of gaps to address some of the underlying concerns reflected in the context of the subject areas to be reviewed and assessed as part of the review of the ETIS programme.

1.5.1 Efforts to Improve Efficiency of Operational Data Collection and User-Experience

112. It has been noted that data collection from Parties can be carried out manually (i.e., via paper and pen). However, manual, paper-based data collection can be fraught with issues around data quality and efficiency. TRAFFIC has recently released a revamped version of the ETIS Online on 15 October 2020 with enhanced user experience, functionality, and online edit and data validation protocols to improve the efficiency and effectiveness of data submission/collection, and enhance data quality.[16,17]

113. Data can be entered individually using an online entry form or uploaded in bulk using a provided excel template. In the "Outputs" section, users can review, amend, and submit newly created records, as well as review, obtain, and suggest amendments to existing seizure data.

114. Access to ETIS Online is restricted to providers approved by the Country's CITES Management Authority, and access to data is provided in accordance with the data access policy outlined in Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens as requested by the Standing Committee at its 69th meeting.

115. Finally, a new online protocol has been introduced to facilitate validation of assignment of countries being implicated by the Party who submits the seizure record.

1.5.2 Enhanced Online Country Reports and Data Accessibility

116. The enhanced ETIS Online facility enables each country to access and download all the ETIS data relevant to them whenever they want. This will serve to improve data quality of existing records, as well as stimulate further reporting, possibly in real time.

117. In the "*Resources*" section, users can download country reports summarizing their country's seizure data in a tabular (xlsx file) or graphical format (pdf file). The resources section also provides links to help view notes including: information on the structure of the data, the most recent ETIS analysis reports and CITES documentation, and peer-reviewed articles documenting the ETIS methodology.

118. The Online country reports are better designed in outlining country's data and the associated charts and graphs, enhancing user experience. Making reporting easier and more user friendly should be a beneficial boost to the system.

1.6 Evolving Contextual Landscape

[16] The Standing Committee, at its 69th meeting (Geneva, November 2017), requested TRAFFIC to finalise the delivery of an online facility for Parties to access, download or upload seizure data in a timely manner.

[17] Development of the online facility was made possible through the financial support of Belgium, Germany, the Netherlands, the European Union and the United States Fish and Wildlife Service.

1.6.1 The Global Context in which CITES Operates

119. CITES is an international Multilateral Environmental Agreement (MEA) to which States and regional economic integration organizations adhere voluntarily. Signatories have agreed to be bound by the Convention, and as such, Parties are legally bound to and must implement CITES, which provides a framework and corresponding obligations to be implemented by each. Parties must also adopt its own domestic legislation to ensure that CITES is implemented at the national level.

120. CITES' aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Therefore, curtailing the illegal wildlife trade is one of CITES' paramount objectives, including the illegal trade of elephant ivory and other specimens.

121. CITES is among the biodiversity-related Conventions with the largest membership, with now 183 Parties[18]. With such a global reach, contribution by all Parties and cooperation amongst them requires strong governance to promote participation, transparency, and accountability, whilst the sovereignty of Parties is respected.

122. It is of interest to note that CITES also manages the Monitoring the Illegal Killing of Elephants (MIKE) programme, which could be considered to also fall under the mandate and objectives of the International Union for the Conservation of Nature (IUCN)[19], but have allowed ETIS - which clearly falls under CITES' core mandate of wildlife trade - to continue to be managed and developed by an NGO since the adoption of the system first developed by TRAFFIC in 1992.

1.6.2 Organizational Change Noted Within the CITES Secretariat at the Time of the ETIS Review

123. Recognizing that there may have been further changes to those observed below, the CITES Secretariat has been undergoing an organization re-alignment and restructuring. The following is reflective of consultations held up to November 2020 and subsequent developments until March 2021. Changes observed during the ETIS review include the following:

- The CITES Scientific Services Division used to oversee both MIKE and ETIS systems and analysis. As a result of the restructuring initiated in 2020, accountability for ETIS is now with the "Knowledge Management" team headed by Haruko Okusu; the rationale being that the Secretariat General wanted all externally funded programs such as ETIS to be under one umbrella.
- The NIAP process falls under the Legal Affairs and Compliance Unit under Juan Carlos Vasquez since compliance is better aligned with the legal domain.

[18] https://cites.org/eng/disc/what.php

[19] One of IUCN's goals is 'Facing the extinction crisis - The extinction crisis and massive loss in biodiversity are universally recognized as a shared responsibility, resulting in action to reduce this loss of diversity within species, between species and in ecosystems. The MIKE programme was at one point managed under the IUCN and subsequently moved to UNEP as part of the CITES Secretariat.

1.6.3 TRAFFIC'S ETIS Team Organization Change and Leadership Transition

124. TRAFFIC is a science-based NGO with wildlife trade as a focus area. ETIS has been developed, managed, and maintained by TRAFFIC with the ETIS Director (Tom Milliken) - the founder of ETIS' precursor - at the helm from inception until the end of 2019.

125. The ETIS analytics had been outsourced to a team of statisticians to develop the fit-for-purpose statistical and analytics framework and to continuously adjust it in response to new information, concerns and feedback from ETIS stakeholders. The Analytics team members were:

- Fiona M. Underwood (Statistician, Co-author of Statistical Methodology)
- Robert W. Burn (Statistician, Co-author of Statistical Methodology – Bayesian SME).

126. The ETIS Director provided the depth and breadth of the domain knowledge that not only was critical for ETIS, but invaluable in providing the relevant and constructive narrative for the analytics output and the ETIS reports. Moreover, he had a wide network across the globe with relevant agencies and subject matter experts, Party's ETIS and MIKE focal points, and CITES Management Authorities alike, that have been instrumental in promoting seizure data submission, conflict management and guiding the Parties with capacity building.

127. The ETIS Director's retirement coincided with the ETIS Statisticians (Fiona Underwood and Robert Burn) stepping back from the ETIS analysis. This allowed a rethinking of the management of ETIS processes moving forward. Dr Sharon Baruch-Mordo was hired to manage ETIS overall including undertaking the statistical analyses required under Resolution 10.10 in line with her expertise. The wider input of elephant trade matters would be supported by TRAFFIC in general. Thomasina Oldfield is the new data analyst's line manager and supervising the ETIS area of work. Louisa Sangalakula has continued to serve as ETIS program officer since its inception and has provided valuable expertise throughout the program personnel transitions. Furthermore, support for ETIS is provided on database management from within TRAFFIC and developers have been brought in to ensure smooth and safe running of ETIS Online.

128. In 2020 TRAFFIC's Executive Director, Steven Broad, announced his decision to step down from his role in early 2021. TRAFFIC has appointed Richard Scobey as its next Executive Director to assume his new role in mid-May 2021.

2. Purpose, Audience and Key Areas of Inquiry

2.1 Purpose

129. This review serves a dual and mutually reinforcing, learning and accountability purpose: to contribute evidence and recommendations that will inform ETIS' supporting systems and business processes going forward; and contribute to improved capacity for responsible, timely and purposeful data use and information management while ensuring the underlying statistical model is sufficiently robust, transparent and scientifically justifiable.

130. Ultimately, the review of the ETIS programme is intended to document findings and recommendations to:

- Underpin the Secretariat's efforts, as per Decision 18.19, to report back to the Standing Committee on any recommendations emanating from the review, at the 73rd meeting of the Standing Committee;

- To support the Secretariat's efforts in the compilation of findings to develop a proposal, consistent with Decision 18.21, for consideration by the Standing Committee at its 73rd meeting, on possible approaches to address the financial and operational sustainability of the MIKE and ETIS programmes.

2.2 Audience

131. The primary audience for the findings and recommendations of the ETIS review are the Standing Committee and Conference of the Parties, as mandated via Decisions 18.18 through 18.20.

132. Senior management and staff from the Secretariat are also anticipated to take a keen interest in the results of the review, as an input towards strategic planning for and linkages to the CITES Strategic Vision 2021-2030, including provisioning for the use of resources going forward - vis-à-vis the broader donor community.

133. Other audiences include TRAFFIC, the MIKE-ETIS Subgroup and MIKE-EITS TAG. Table 3 below articulates the various key groups identified as having a contribution to, and/or interest in the ETIS review and its recommendations.

Table 3: Stakeholder Analysis

Stakeholder(s)	Stakeholders' role in relation to ETIS	Interaction with Evaluation Team during the ETIS review	Primary interest in the ETIS review findings and recommendations
CITES Standing Committee	• The Standing Committee is a key stakeholder as it adopted the ToR for a review of the ETIS programme.	• Directed the Secretariat to appoint a group of independent experts to carry out the	• As per CoP Decisions 18.19 and 18.21, the Secretariat will compile results and findings from the review for

Table 3: Stakeholder Analysis

Stakeholder(s)	Stakeholders' role in relation to ETIS	Interaction with Evaluation Team during the ETIS review	Primary interest in the ETIS review findings and recommendations
	• The Standing Committee: ○ Reviews actions taken by the Parties to implement the provisions of Resolution Conf. 10.10 (Rev. CoP18), particularly – but not limited to – the provisions concerning trade in elephant specimens; ○ Considers ETIS reports submitted in terms of Resolution Conf. 10.10 (Rev. CoP18); ○ Considers and adopts recommendations relating to the NIAP process.	review of the ETIS programme; • As part of Party consultations in September 2020, the consultants engaged with Kenya, China, Belgium and Canada[20].	consideration by the Standing Committee at its 73rd meeting. On the basis of this it will formulate its own recommendations for consideration at the 19th meeting of the Conference the Parties; • Interested on whether there is any policy guidance concerning the implementation of the Convention that can be provided to the Secretariat on the basis of the outcomes of the ETIS review; • Interested in understanding if the methodology in place is robust enough to accurately report on wildlife crime related to the illegal trade ivory (origin, transit and destination).
MIKE-ETIS Subgroup	• Responsible, when necessary as articulated in its ToR, for ensuring Resolution Conf. 10.10 (Rev. CoP18) on *Trade in elephant specimens*, including ensuring the accompanying annexes remain valid and pertinent; • Regularly reviews the institutional and administrative arrangements of	• During Party consultations in September 2020, the consultants engaged with China, Belgium and Canada[21].	• Interested in understanding if the ETIS review responds to the ToRs adopted by the Standing Committee and any specific requirements; • Will be interested in any recommendations covering institutional and administrative arrangements on ETIS; • Will be interested in and likely weigh in on any proposed amendments to the

[20] https://cites.org/eng/com/sc/member.php

[21] https://cites.org/eng/prog/mike/index.php/portal#MIKE%20and%20ETIS%20Technical%20Advisory%20Group

Table 3: Stakeholder Analysis

Stakeholder(s)	Stakeholders' role in relation to ETIS	Interaction with Evaluation Team during the ETIS review	Primary interest in the ETIS review findings and recommendations
	MIKE and ETIS, and provides advice and formulate recommendations as appropriate; • Reviews policies regarding the collection, compilation, use and publication of MIKE and ETIS data, analysis and findings.		collection, compilation, use and publication of ETIS data and analysis; • Keen on any findings regarding the financial and operational sustainability of the ETIS programme.
MIKE-ETIS TAG	• The TAG is expected to provide their technical / scientific experience on both the ETIS data governance and statistical procedures[22].	• The consultants engaged select TAG members from the "individual category" during the initial briefing and kick-off meeting; • TAG members provided key documentation on previous informal reviews; • TAG members responded to queries during the review to answer questions related to the statistical model as it was not possible to engage with the TRAFFIC statisticians; • One TAG member acted as a sounding board for preliminary observations and findings on 5 November 2020 to help frame and provide guidance on the deliverables and refine	• Ensuring the technical and practical soundness of the ETIS monitoring system in meeting their objectives as defined in Resolution Conf. 10.10 (Rev. CoP18).

[22] Reference made to the TAG's Terms of Reference for specifics

Table 3: Stakeholder Analysis

Stakeholder(s)	Stakeholders' role in relation to ETIS	Interaction with Evaluation Team during the ETIS review	Primary interest in the ETIS review findings and recommendations
		recommendations therein.	
CITES Secretariat	• Administration and oversight of consultants' statements of work; • Mandated by Parties to report findings on key areas requested by the Standing Committee, and any recommendations emanating from the review at the73rd meeting of the Standing Committee.	• Initial briefing and kick-off meeting; • Provided consultants with key documentation and artifacts via Dropbox; • Facilitation at introductory meetings with key stakeholders; • Intermittent touch points for clarifications and requests for further information / documentation relevant to the engagement; • Enforcing regular check-points and milestones; • Facilitated the consultation and review of the consultants' deliverables with stakeholders.	• Identifying opportunities and priorities articulated in the ETIS review findings / recommendations that will reinforce core Convention objectives; • Input towards strategic planning for and linkages to CITES Strategic Vision 2021-2030 and perhaps the post-2020 global biodiversity framework; • Input into collating information to action Decisions 18.19 and 18.21 to the Standing Committee.
CITES Parties involved in the NIAP process (Category A, B and C countries)	• Were invited to submit written observation on the ETIS methodology.	• While no interaction was originally foreseen at the outset of the assignment, the consultants held consultations with 15 Parties in September 2020	• To better understand the findings of the ETIS review, having access to reliable factual data and understanding of any implications / recommendations on Annex 1 and Annex 3 of Resolution 10.10 (Rev CoP18) Trade in elephant specimens.
Parties to the Convention	• Parties were invited to submit written observations on the ETIS methodology to be	• No formal interaction with the consultants aside from those CITES Management Authorities (CMA) noted above.	• Parties through their CITES Management Authority should provide information on seizure confiscation of ivory or other elephant specimens. The

Table 3: Stakeholder Analysis

Stakeholder(s)	Stakeholders' role in relation to ETIS	Interaction with Evaluation Team during the ETIS review	Primary interest in the ETIS review findings and recommendations
	considered in the review process. • Provided financial support for the review of the ETIS programme.		findings are expected to help to raise awareness on what is expected from Parties going forward and why; • Parties' primary interest is also to have a user-friendly methodology (transparency and usability) which can allow for better reporting and understanding of the ETIS analysis and access to reliable factual data to inform their decision making.
TRAFFIC	• Key stakeholder that is currently managing the ETIS on behalf of Parties.	• TRAFFIC assisted the consultants in collecting and sharing requisite documentation and data, providing specifications / database information, SoPs, system access / training, providing information on the 'R' code and statistical methodology, and responding to queries during preparation of the consultants' deliverables.	• TRAFFIC will be keen to understand any implications from the ETIS review assessment / findings / recommendations on the current state and any proposed amendments in the future state roadmap, including financial / resource sustainability issues.
Legacy members of TRAFFIC and key statisticians	• Providing historical context, validating questions and offering frank views on potential areas of focus and/or change.	• Consultants were only able to engage with TRAFFIC's former Elephant and Rhino Programme Leader and Founder of ETIS, although they provided a wealth of information both in virtual	• Keen to review the ETIS review report from an information perspective from a legacy perspective.

Table 3: Stakeholder Analysis

Stakeholder(s)	Stakeholders' role in relation to ETIS	Interaction with Evaluation Team during the ETIS review	Primary interest in the ETIS review findings and recommendations
		interviews and written responses to questions.	
IUCN	• Provides technical leadership on TRAFFIC's analytical work related to trade in elephants, including inputs to ETIS.	• Were not engaged as part of the ETIS review.	• Keen to review the ETIS review report from an information perspective on assessments made and future recommendations.
IUCN African Elephant Specialist Group	• The African Elephant Specialist Group (AfESG) is a group of technical experts focusing on the conservation and management of African elephants to promote the long-term conservation of Africa's elephants and, where possible, the recovery of their population to viable levels. • The African Elephant Specialist Group is mandated through Paragraph 12(b) of Resolution Conf. 10.10 (Rev. CoP18) to submit any new and relevant information on the conservation status of elephants, pertinent conservation actions and management strategies; and African elephant range States to	• Were not engaged as part of the ETIS review.	• Keen to review the ETIS review report from an information perspective on assessments made and future recommendations.

Table 3: Stakeholder Analysis

Stakeholder(s)	Stakeholders' role in relation to ETIS	Interaction with Evaluation Team during the ETIS review	Primary interest in the ETIS review findings and recommendations
	provide information on progress made in the implementation of the African Elephant Action Plan.		
IUCN Asian Elephant Specialist Group	• The Asian Elephant Specialist Group (AsESG) is a global network of specialists concerned with the study, monitoring, management, and conservation of Asian Elephants in its 13 Range States to promote the long-term conservation of Asia's elephants and, where possible, the recovery of their populations to viable levels. • The Asian Elephant Specialist Group is mandated through Paragraph 12(b) of Resolution Conf. 10.10 (Rev. CoP18) to submit any new and relevant information on the conservation status of elephants, pertinent conservation actions and management strategies. • Group members helped in the development of ETIS.	• Were not engaged as part of the ETIS review.	• Keen to review the ETIS review report from an information perspective on assessments made and future recommendations.

Table 3: Stakeholder Analysis

Stakeholder(s)	Stakeholders' role in relation to ETIS	Interaction with Evaluation Team during the ETIS review	Primary interest in the ETIS review findings and recommendations
UN Environment Programme World Conservation Monitoring Centre	• Pursuant to Paragraph 12(b) of Resolution Conf. 10.10 (Rev. CoP18), is mandated to provide an overview of trade in elephant specimens as recorded in the CITES database.	• Were not engaged as part of the ETIS review.	• Keen to review the ETIS review report from an information perspective on assessments made and future recommendations.
UN Office of Drugs and Crime (UNODC)	• UNODC produces the World Wildlife Crime Report drawing upon the best available data provided by international bodies and enforcement authorities, including data from the annual illegal trade reports that CITES Parties are required to submit to the CITES Secretariat. • Discussions also currently ongoing in accordance with Decision 18.75 for UNODC to establish, host and maintain a database for the storage and management of illegal trade data collected through annual illegal trade reports.	• Were not engaged as part of the ETIS review.	• Keen to review the ETIS review report from an information perspective on assessments made and future recommendations.

2.3 Key areas of inquiry

134. Consistent with the forward-looking nature and objective of ETIS' continual refinement, Paragraph 27 (a) of Resolution Conf.10.10 (Rev. CoP18) notes:

"*the systems known as Monitoring the Illegal Killing of Elephants (MIKE) and the Elephant Trade Information System (ETIS), established under this Resolution and supervised by the Standing Committee, shall continue and be expanded with the following objectives:*

i. measuring and recording levels and trends, and changes in levels and trends, of illegal elephant killing and trade in ivory and other elephant specimens in elephant range States, ivory consumer States and ivory transit States;

ii. assessing whether and to what extent observed trends are related to measures concerning elephants and trade in elephant specimens taken under the auspices of CITES; changes in the listing of elephant populations in the CITES Appendices; or the conduct of legal international trade in ivory;

iii. establishing an information base to support the making of decisions on appropriate management, protection and enforcement needs; and

iv. *building capacity in elephant range States and, as applicable, countries involved in trade in elephant specimens, to implement and make use of MIKE and ETIS in managing elephants and enhancing enforcement.*"

135. As per the "Duties and Responsibilities" noted in the Terms of Reference, the review of the ETIS programme was executed to ensure that:

a. ETIS is operating in an appropriate, transparent and accountable manner;
b. CITES Parties are engaged as appropriate; and
c. ETIS produces scientifically robust analyses to be used in CITES decision making processes in accordance with the provisions in Resolution Conf. 10.10 (Rev. CoP18). Based on the review findings, recommendations should be formulated to:
    i. further strengthen the methodology used throughout the ETIS process (if required);
    ii. address the institutional arrangements and resources needed to implement any proposed recommendations to amend the ETIS methodology or Resolution Conf. 10.10 (Rev. CoP18); and
    iii. deal with the institutional arrangements and resources needed to adequately meet the objectives of ETIS and ensure its longer-term sustainability.

136. With the above in mind, the review honed its efforts on answering the following four Key Evaluation Questions (KEQ), also noted in the Inception Report, and the review team actively sought answers to them through the lens of their respective subject matter expertise:

KEQ1: Is ETIS still serving for what it was originally intended, and do the data and analytics within ETIS enable the Parties to monitor trends in illegal trade in elephant specimens, in particular ivory and to inform the NIAP process?

KEQ2: Can ETIS' current support, management arrangements, and governance structure(s) be sustained (both financially and from a human resource perspective), or does it require a revised framework and what are the options?

KEQ3: What evidence is present to suggest that the ETIS analysis has highlighted deficiencies in the end-to-end trade chain and promoted further investment to close identified gaps?

KEQ4: Going forward, what operational gaps and redundancies need to be addressed to make the ETIS programme more effective and efficient?

3. Methods and Approaches

137. The purpose of this chapter is to reflect on the evaluation methodology documented in the Inception Report and to articulate any deviations therein, as well as any limitations encountered during the execution of the ETIS review.

138. While the overall methodology and approach as described in the Inception Report remain largely unchanged, data gathered, explicit value-added requests by the CITES Secretariat, and several limitations faced during the inception and fact-finding stages of the review, were used to finesse the methodology and supporting timeline.

3.1 Overview

139. The minimum requirements and combined tasks of the ETIS review team in the Terms of Reference in Annex A, include:

- a review of the provisions in Annex 1 of Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens, with special reference to sections 2-5 to determine whether these provisions and their implementation are adequate to meet the objectives of ETIS, and are sufficiently robust, transparent and scientifically justifiable;
- an assessment of whether the processes[23] used by TRAFFIC are adequately described in Annex 1 to Resolution Conf. 10.10 (Rev. CoP18), and sufficiently contribute to achieving the objectives of ETIS;
- an assessment of whether there is a need to amend Annex 1 in Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens and proposed revisions;
- whether the ETIS analysis is able to support CITES processes and decision making such as the NIAP process outlined in Annex 3 to Resolution Conf. 10.10 (Rev. CoP18);
- a review the current institutional arrangements and resources available to meet the objectives of ETIS;
- an assessment of reporting requirements created under Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens and Resolution Conf. 11.17 (Rev. CoP18) on National reports.

140. To support the above, the ETIS review team followed a participatory, consultative and utilisation-focused approach to conduct the assignment. A guiding principle throughout the engagement was to ensure that the ETIS review would be as useful as possible, and that it fosters the buy-in of findings, conclusions and recommendations among stakeholders to instil confidence in and support decision-making and proposals by the Secretariat to the Standing Committee on ETIS going forward. The consultants also sought to add value at various junctures by offering pragmatic recommendations and solutions to perceived shortcomings where these were observed.

[23] Comprising i) data collection ii) data validation iii) data management iv) data analysis, including the underlying code / algorithm to support it v) data interpretation vi) review of analysis vii) technical outputs and reports viii) data dissemination, and ix) reporting the results of the analysis to Parties and the CITES Secretariat.

141. Of paramount importance, the review adhered to the evaluation rules and standards of the United Nations System, as well as the Evaluation Quality Standards from DAC/OECD[24]. It was also aligned with the obligations of evaluators relating to independence, impartiality, credibility, conflicts of interest, and accountability.

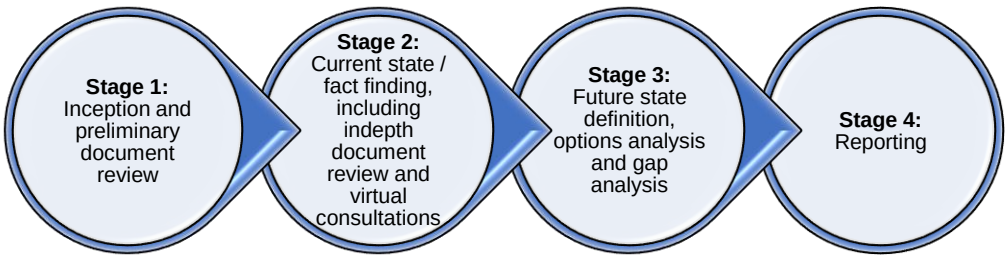
142. As a UNEP-administered Convention, the review was underpinned by an evaluation framework presented in Table 6, based on the underlying questions in the ToR and others vetted by the CITES MIKE Coordinator during the Inception and Fact-Finding stages. These were bundled under UNEP's evaluation criteria of strategic relevance, effectiveness, efficiency, sustainability and impact, which are a subset of the typical list that would normally be applied to UNEP projects, albeit tailored to align with the scope and context of the ETIS review (see Section Five).

143. In practice, and as depicted in Figures 6 and 7 below, the ETIS review was conducted in four methodological phases, which were sequenced as follows: (a) inception stage and preliminary document review, (b) current state / fact finding stage, including in-depth document review and virtual consultations, (c) future state definition stage, including options analysis and gap analysis, and (d) reporting.

144. The ETIS related review requirements, the current and future state analysis and recommendations have been grouped under three major categories within this report:

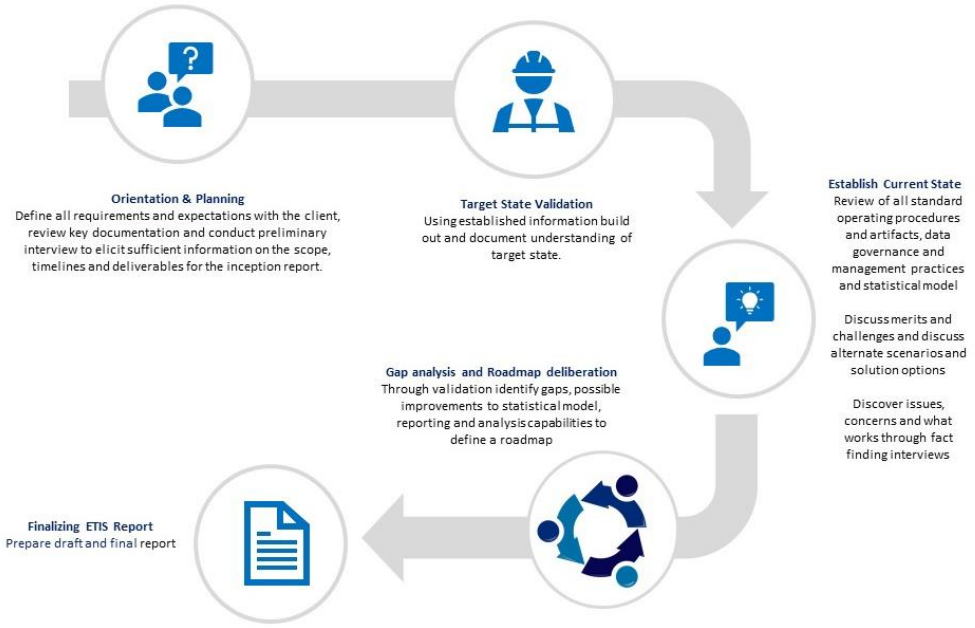
- Overall governance, information governance, supporting processes, and ETIS sustainability;
- Data management which included data acquisition and preparation, data quality management and validation, information dissemination, use and control, and;
- Analytics methodology, supporting programing code, and analytics interpretation.

Figure 6: Stages of the ETIS Review Stages



[24] https://www.oecd.org/dac/evaluation/qualitystandards.pdf

Figure 7: Approach to the ETIS Review at Inception



145. The review used a mixed-methods approach to collect and triangulate data from different sources, using both quantitative and qualitative techniques. This approach supported the development of robust, evidence-based findings, which in turn allowed for the development of insightful findings, validated conclusions, and recommendations. The review team used a range of data collection and analysis tools and four main methods were proposed to conduct this assignment. The subsequent sections of this chapter provide more detail on each of the following methods of data collection employed for this review:

- Document review;
- Key informant interviews;
- Observation;
- Hands-on review of code and process mapping.

146. The inception phase of the ETIS review began on 25 June 2020 with a kick-off meeting with the CITES MIKE Coordinator. Following a preliminary document review and initial consultations with the CITES Secretariat and key stakeholders, including TRAFFIC and select members of the TAG, the ETIS review team articulated an approach to the review and developed supporting questions. On August 18, 2020, the inception report was submitted to the CITES Secretariat, outlining a proposed methodology and evaluation tools (specifically an evaluation matrix) and an indicative workplan. This inception report/workplan was approved on 7 September 2020, with input from the CITES Secretariat Senior Management Team, including the CITES Secretary-General. Data collection began in late August and continued through January 2021.

147. A PowerPoint deck of preliminary observations and agreed findings between the two consultants was shared in advance and presented to the Secretary-General on 29

October 2020. As per her deliverables in the TORs, this was followed by a draft report on the ETIS statistical model and analysis by the Data Management and Statistical Analysis Specialist submitted to the CITES Secretariat for comment in mid-January 2021. Finally, a consolidated draft report, which leveraged the deliverable by Data Management and Statistical Analysis Specialist, as appropriate, was compiled by the Governance and Business Process Specialist and submitted to the CITES Secretariat for comment in early February 2021. Consistent with the ToR of the ETIS review, the consultation process included sharing the deliverables with Parties, TRAFFIC and the TAG. Once approved, the CITES Secretariat will subsequently report the findings and prepare proposals requested by the Standing Committee, along with any recommendations emanating from the review, at the 73rd meeting of the Standing Committee when it is rescheduled[25].

3.2 Strategic Nature of the ETIS Review

148. Contrary to typical reviews, the assignment was conceived without specific measurement criteria (e.g., to assess progress against Key Performance or Lead Indicators) or expected outcomes, given that the scope of the evaluation is to review operational data practices and approaches, governance and reporting, as well as the underlying statistical model anchoring ETIS. Therefore, the data collection methodologies of process mapping, key informant interviews, document review, observation and hands-on review of the code were used to develop an understanding of organizational systems, practices, governance structures and nuances around the data management and ETIS data lifecycle.

149. Aside from reflecting on some of the important achievements realized by ETIS to date, the primary emphasis has been on a forward-looking strategic review, in that, the evidence gathered has been analysed with an understanding and consideration of the ongoing external and internal changes to close gaps and concerns raised by Parties. Accordingly, the conclusions and recommendations are appropriately situated to provide maximum utility based on the evaluation's assessment, options for the future context.

3.3 Data Collection of Qualitative Data

150. Table 4 sets out the main data collection methods and parameters used in the ETIS review. A minimum level of data was collected and cross-referencing established to ensure the rigour of the findings. After identification of the findings, a synthesis process and gap-analysis resulted in a small number of strategic conclusions and recommendations that were anchored to requirements in the ToRs.

[25] The 73rd meeting of the CITES Standing Committee was scheduled to take place from 5 to 9 October 2020, in Geneva, Switzerland. The meeting did not take place on those dates due to the COVID-19 pandemic. CITES Parties have been officially informed of these developments through Notification to the Parties No.2020/051 and the Secretariat will be announcing any arrangements to move the work of the Standing Committee to when it is possible in 2021.

151. In order to facilitate course correction and adaptive management a series of recommendations are presented in Section Six.

152. A number of callout boxes of anonymized quotes - scrubbed of PII - from some of the interviews held during the fact-finding stage are spread throughout the report to reinforce some of the observations and learnings.

Table 4: Overview of data collection methods

Method	Method Sub-group (if applicable)	Number
Document review	N/A	70+
Interviews with key stakeholders	CITES Secretariat	9
	TRAFFIC (current staff)	11
	TRAFFIC (former staff)	2
	Parties	15
	TAG	3
	MIKE-ETIS Subgroup (former Chair)	1
Observation	Review sessions on ETIS Online Functionality, ETIS Data Structure, PostgreSQL Database Management System, 'R' Code as well as validation of current state processes	5
Code review	Code made available to Parties on GitHub through Notification No. 2019/046	1
	Code updates by the TRAFFIC Senior Analyst Elephant and Rhino Trade	1

3.3.1 Document Review

153. The review team reviewed an exhaustive list of documentation related to ETIS' operations, processes, governance, statistical methods, CoP documents (both information documents and resolutions) and reports to the CoP, as well as background on the illegal wildlife trade and how data and information are used to achieve ETIS' programming goals. More than 70 documents, publications, presentations and reports were provided to the evaluation team, at the inception phase of the assignment, and many more were collected, read and discussed over the course of the review (Ref. Annex C for a list of documentation consulted), going well beyond the minimum documentation to be consulted articulated in the ToR noted in Table 5 below.

Table 5: Minimum Documentation to be Consulted in the ETIS Review

No.	Document Name
1.	Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens
2.	Resolution Conf. 11.17 (Rev. CoP18) on National reports
3.	Issues raised by Parties in relation to the ETIS methodology and analysis
4.	Document SC69 Doc. 29.3
5.	ETIS reports submitted for consideration by the Conference of Parties, including documents CoP17 Doc. 57.6 (Rev. 1) and CoP16 Doc. 53.2.2 (Rev. 1)
6.	Information documents CoP17 Inf. 67 and SC69 Inf. 22
7.	Underwood, F.M., Burn, R.W., Milliken, T. (2013). Dissecting the illegal ivory trade: an analysis of ivory seizures data. PLoS One 8(10): e76539;
8.	Burn, R.W., Underwood, F.M. (2012). A new statistical modelling framework to interpret

	ivory seizures data: A technical report describing the new modelling framework for analysing seizures data from the Elephant Trade Information System. Mathematics Report series (1/2013), Department of Mathematics and Statistics, University of Reading, UK
9.	Existing databases and standard operating procedures used in the ETIS analysis

Source: Terms of Reference

154. The evaluation received an ample body of documentation in order to undertake its preliminary document review, albeit with some challenges noted by the Data Management and Statistical Analysis Specialist, regarding the running of the ETIS 'R' code-base to facilitate the interpretation of the ETIS methodology (see Annex A in the statistical report appended herein as Annex M).

3.3.2 Key informant interviews

155. Interviews with key stakeholders form a central component of the evaluation methodology, as an important element of inclusive, participatory and formative review.

156. The ETIS review team held a comprehensive set of individual and group key informant interviews conducting a total of 41 interviews with more than 50 people (Ref. Annex D), a number of which were interviewed more than once. Interviewees included CITES Secretariat staff, including members of the senior management team, current and former members of TRAFFIC and members of the TAG and MIKE-ETIS Subgroup. As a result of COVID-19 and lack of travel associated with the engagement, stakeholders were engaged via Skype, Zoom or Microsoft Teams.

157. At the request of the CITES Secretary-General the following Parties were approached to request whether or not they wished to engage and participate in the ETIS review:

- Parties that submitted comments based on Notification 2019/009: Nigeria, Singapore, China (Hong Kong SAR);
- Parties in the NIAP process (exited): Kenya, Uganda and United Republic of Tanzania;
- Parties identified in the ETIS analysis but not part of the NIAP process: South Africa, United Arab Emirates, Turkey and Zimbabwe;
- Category A countries (not listed above): Malaysia, Vietnam, Mozambique and Togo;
- Others (not listed above): Thailand and Gabon;
- MIKE ETIS Subgroup members (not in NIAP process and not elephant range States): Belgium and Canada.

158. Whilst the review team anticipated the response rate from Parties would be approximately 50%, it received overwhelming interest from 84% of Parties contacted resulting in the majority of the month of September being earmarked for Party consultations.

159. Interview protocols were informed by the approved questions in the evaluation matrix in Table 6 below or a permutation therein. Protocol adhered to with Parties was generally more formal, following the standard protocol provided in Annex E.

Table 6: Evaluation Framework		
Evaluation Criteria/Sub-criteria	**Example Questions/Issues to be addressed**	**Main data sources & methods**
A. Strategic Relevance The extent to which the activity is suited to priorities/policies of target groups, recipient and donor	• To what extent are the current interventions and outputs of ETIS consistent with the attainment of ETIS' objectives?	• Traceability of current state analysis to Paragraph 27 and relevant accompanying Annexes in Resolution Conf. 10.10 (Rev. CoP18)
	• How relevant has ETIS been as a tool to address Parties' challenges in surfacing dynamics of the illegal ivory supply / trade chain / consumption?	• Review of CoP reports and results from interviews with key stakeholders
B. Effectiveness Assess effectiveness across three components: delivery of outputs, achievement of direct outcomes, monitoring and reporting, and likelihood impacts	• How relevant has the ETIS been in providing reliable evidence of trends in the illegal ivory trade and informing decision making?	• Review of CoP reports and results from interviews with key stakeholders, as well as a review of NIAP's outcome history
	• Have the specific roles and responsibilities of the key stakeholders been documented in relation to programme's delivery and effectiveness?	• Key ToRs of stakeholders and results from interviews
	• To what extent has the ETIS programme raised CITES' profile and consolidated the knowledge base on the illegal ivory trade and supply chain?	• Results from interviews and findings in scientific reports
	• Is ETIS still serving what it was originally intended for and do the data and analytics within ETIS enable the Parties to monitor trends in illegal trade in elephant specimens, including ivory, and to inform the NIAP process?	• Results of gap analysis between target and current state as well as outcomes from interviews with key stakeholders
	• Is ETIS leveraging the most innovative and effective approaches possible?	• Review of statistical methods, findings from informal review and discussions with statisticians, as well as outcomes of code review
C. Efficiency Cost-effectiveness and timeliness	• To what extent have the objectives of the ETIS programme been achieved with the lowest possible use of resources/ inputs in terms of expertise, time and cost?	• Review of budget versus expenditure reports, review of resource support against operating model, and results from interviews

Table 6: Evaluation Framework		
Evaluation Criteria/Sub-criteria	**Example Questions/Issues to be addressed**	**Main data sources & methods**
	• How efficient is the ETIS programme being implemented and monitored?	• Study of output reports, donor reports, and review of capacity cycle
	• To what extent can operations be maintained going forward?	• Interviews with the stakeholders, plans and forecasts, as well as gap analysis results
D. Sustainability Key conditions and factors that influence persistence of achieved outcomes	• If funding were not an issue, what are the gaps in ETIS as a whole (platform, tools, support, management, expertise) that you would prioritize for implementation in the near future?	• Interview results
	• Going forward, what operational gaps and redundancies should be addressed to make the ETIS programme more effective and efficient? What would a road map for these changes look like?	• Interview results and results of gap analysis
	• To what extent is the sustainability of the results, and onward progress towards impact, dependent on issues relating to institutional frameworks and governance?	• Interview results and study of governance effectiveness
	• How robust are the institutional achievements such as governance structures and processes, policies, sub-regional agreements, legal and accountability frameworks etc. required to sustaining results?	• Interview results and study of governance effectiveness
	• Are there any financial risks that may jeopardize the sustainability of project results and onward progress towards impact?	• Interview results and study of donor support vs. necessary inputs
E. Impact Formative reflections and observations of impact across cross-cutting themes such as	• To what extent has ETIS produced positive or negative changes, intended or unintended in advancing issues related to the illegal ivory trade?	• Interview results and gap analysis results and reports

Table 6: Evaluation Framework		
Evaluation Criteria/Sub-criteria	**Example Questions/Issues to be addressed**	**Main data sources & methods**
readiness, quality of execution, stakeholder engagement and participation, country ownership and communications.	• What evidence is present to suggest that ETIS analysis has highlighted deficiencies in the end-to-end trade chain and promoted further investment to close identified gaps?	• Interview results and gap analysis results and reports (including results from the NIAP process)

3.3.3 Observation

160. The following observational activities provided the review team with a window into ETIS' observed operations, data lifecycle, processes, and supporting governance:

- Session on ETIS Online functionality and admin dashboard;
- Sessions on ETIS Data Structure, PostgreSQL Database Management System;
- Sessions to validate processes documented and/or reengineered by the Governance and Business Process Specialist.

3.3.4 Hands-On Code Review

161. The ETIS review also included:

- A review of the scripts published on GitHub for Parties through Notification No. 2019/046 were run with the help of both the Notes files published on GitHub, and the TRAFFIC's SoP Manual[26];
- An updated version of the code reflecting changes made by TRAFFIC's Senior Analyst, was used to replicate CoP18 results.

3.3.5 Limitations

162. There are challenges inherent in undertaking such a complex review with a broad set of stakeholders in the context of a biodiversity-related Convention, let alone during a global pandemic. The review team encountered a few limitations worth noting when conducting data collection and while validating the statistical model through interpretation of the code:

- **Impact of the COVID-19 global pandemic.** It is important to reflect on the challenges and limitations posed by the COVID-19 pandemic on the ETIS review. The review team was not able to meet virtually with TRAFFIC's former Elephant and Rhino Programme Leader, ETIS Director, Tom Milliken, until 48 days after the start of engagement due to travel restrictions and limited internet connectivity,

[26] The Data Management and Statistical Analysis Specialist notes in her report that the code to analyze the ETIS data is contained in 38 separate R scripts. These were originally developed under the Darwin Initiative project 17-020 in collaboration with the University of Reading over the period 2009 – 2013. Since then, the ETIS analysis has been revised and the R code has been adapted over time. The set of R scripts published on GitHub are the R code used to transform the ETIS data into the outputs for the CoP18 report.

although he did make himself available quite extensively thereafter, in spite of being in retirement, both virtually and through email correspondence when needed. A formal handover and onboarding of TRAFFIC's new Senior Analyst who started in May 2020 was also hampered by COVID-19. It was not possible due to COVID-19 health issues, to engage with either Fiona M. Underwood or Robert W. Burn at any juncture during the review. As the main statisticians responsible for the formulation of the ETIS methodology this is perhaps one of the main limitations and shortcomings of the review. As a result of unavailability of TRAFFIC's former statistician, the Data Management and Statistical Analysis Specialist had to rely on the combined input by the TAG statisticians, TRAFFIC's Senior Analyst and its former Elephant and Rhino Programme Leader[27]. Notwithstanding the mitigation strategy, some gaps persisted, notably with understanding the cluster analysis as none of these individuals had run it previously;

- **The review coincided with the release of ETIS Online.** The ETIS review ran in parallel to an extremely busy but important time for TRAFFIC as key resources also supporting the review were preparing for both the soft launch and official release of ETIS Online in October 2020. Taken together, the considerable work to move ETIS to the web (including *inter alia* migration / digitization of data collection forms, translation work, coding, testing, bug fixes, collation of training materials etc.) at times impacted TRAFFIC's responsiveness to the consultants' request for documentation, validation of artifacts and updated code (Ref. Annex F);

- **Onboarding of new resources without handover or knowledge transfer.** With the recruitment of a Senior Analyst in May 2020, TRAFFIC has now brought the statistical capacity underpinning ETIS in-house. Unfortunately, a combination of factors resulted in this resource having to ramp up quickly and independently without a proper handover, without training or job shadowing. This has been compounded with the busy timeframe to understand the code, compile an ETIS report to the MIKE-ETIS TAG on 2 July 2020, oversee delivery of ETIS Online and support the ETIS review, as well as a number of personal challenges. , the Senior Analyst deserves credit. Notwithstanding, the trade-off has been to prioritize certain aspects of the job at the expense of others. For example, the Senior Analyst reported that there was no time to analyze the cluster analysis part of the methodology and since normally this analysis would not be done until the second part of the intersessional period, it was not a priority at the time, hence could not be consulted on this dimension of the statistical model.

- **Issues encountered while running the code.** The Data Management and Statistical Analysis Specialist encountered a number of errors while running the code during the assessment of the statistical model. It is important to note that while TRAFFIC's Senior Analyst did not experience such errors, the same errors were experienced by a member of the TAG in January 2021, who subsequently

[27] As noted by the Data Management and Statistical Analysis Specialist in their deliverable under the consultancy "Despite the limitations referred to above, the availability of Tom Milliken, former ETIS Director and Louisa Sangalakula, the TRAFFIC ETIS Programme Officer assisted with information that was considered as part of the review".

adopted the solutions proposed by the Data Management and Statistical Analysis Specialist to overcome them.

163. The above are the major issues encountered that were discussed between the consultants and the CITES MIKE Coordinator, and raised with the CITES Secretary-General as justification for revisiting and amending the ETIS review's timelines. Other limitations have been noted in the Preamble of the statistical report by the Data Management and Statistical Analysis Specialist, appended in its entirety in Annex M.

3.3.6 Deviations

164. The following deviations from the ToR and Inception Report are noted:

- The Terms of Reference envisioned a progress report to the Standing Committee. However, the consultancy started later than anticipated raising concerns of whether the consultants would have sufficient data to support its findings in time. This was followed by the Standing Committee meeting being postponed outright due to the COVID-19 pandemic. In lieu of a progress report, a preliminary observations and findings deck (Ref. Annex G) was made available and presented to the CITES Secretary-General on 29 October 2020 and subsequently to a member of the TAG on 5 November 2020 to solicit input and advice on framing the recommendations in the final deliverable(s);

- While the ToR is silent on the need for a review of the code, the Inception Report and a preceding briefing note prepared for the CITES MIKE Coordinator highlighted that an end-to-end review of the code would be time consuming and perhaps not the best use of the Data Management and Statistical Analysis Specialist's time. The Inception Report indicated that "*at the guidance of the MIKE-ETIS TAG statisticians and in view of the available time, the Data Management and Statistical Analysis Specialist will prioritize certain aspects of the code in their review*". Notwithstanding, additional requirements were introduced by the CITES Secretariat during the ETIS review to examine the entire code and to replicate results from CoP18;

- The review did not adhere to the three-week review cycle accounted for in the Inception Report, leading to a protracted review process that lasted well over six months, with multiple iterations of both the statistical and consolidated reports.

- The following assumptions were made in the Inception Report;
    - The ETIS review team would liaise with all 12 members of the TAG at least once;
    - The ETIS review team would liaise with all 8 members of the MIKE-ETIS Subgroup;
    - The ETIS review team will engage the current Chair of the Standing Committee as part of the engagement;
    - Aside from Parties comprising the MIKE-ETIS Subgroup, the review team would not interview any Parties directly.

165. While the ETIS review team only met with 3 members of the TAG and solicited input from 3 members of the MIKE-ETIS Subgroup through consultations with the People's Republic of China, Belgium and Canada, quite extensive consultations were held with a broad range of Parties at the request of the CITES Secretary-General.

3.3.7 Value Added Inputs During the Fact-Finding Stage

166. As noted above, the review team sought to add value at various junctures by offering pragmatic recommendations and solutions to perceived shortcomings where these were observed, including:

- Recommendation made to TRAFFIC by the Governance and Business Process Specialist on 28 August 2020 on functionality in ETIS Online that would enable Parties to contest data reported by another Party implicating them that would be written to the system logs as an audit trail[28];

- Suggestion made by the Governance and Business Process Specialist to colour code the Source Reliability and Data Completeness matrix in the SoPs to make it more intuitive on which cells will be taken into account in the ETIS analysis. This is reflected in Section 2.2. of the report by the Data Management and Statistical Analysis Specialist.

- Suggestion by the Data Management and Statistical Analysis Specialist on the sequence / order in which the scripts need to be run to facilitate the interpretation of both the ETIS methodology and code itself as a helpful visual ordering;

- Recommendation by the Governance and Business Process Specialist that TRAFFIC's capacity building plan, to support the launch of ETIS Online, should include training sessions with Parties. One of which should always be made available online (and refreshed as needed as questions come in from Parties) as a self-directed resource to enhance learning;

- Defect raised by the Governance and Business Process Specialist on blank cells in queries requested which turned out to be an issue with RinRuby, a library that integrates the R interpreter in Ruby which makes R's statistical routines and graphics available. As a result, this defect was investigated and resolved in December 2020;

- Recommendation by the Data Management and Statistical Analysis Specialist on the advantages of an "Rmarkdown" that can be automatically updated as code fragments are updated to create a living document that links existing scripts

[28] It was noted that this functionality would need to be eventually supported by a workflow and a trigger for the CITES Secretariat to intervene if not resolved within a defined timeframe.

together[29].

3.4 Implementation and Timeline

167. This consolidated report leverages to the extent possible, the deliverable produced by the Data Management and Statistical Analysis Specialist for specific sections herein, and proposes recommendations that have been jointly agreed to. It also recognizes the lens through which the Governance and Business Process assessment was undertaken is quite different potentially leading to different interpretations, observations and findings. It is important to note there are other recommendations in the parallel report by the Data Management and Statistical Analysis Specialist which ought to also be considered (in Annex L), but those documented herein were jointly discussed, validated and presented to the CITES Secretary-General for input and validation.

168. The combination of challenges encountered during the data gathering phase, extensive consultation with Parties throughout the month of September, and net new requirements have shifted out the timeline of the engagement against its original forecast. Table 7 shows the main milestones and the target dates for completion.

Table 7: Timelines

Deliverable	Forecast at Inception	Forecast at Debrief with CITES Secretary-General on 29 October 2020	Draft to CITES for Comment	Ready for Circulation to Stakeholders	Finalized / Approved
Deliverable 1: Inception Report	12 August 2020	N/A	18 August 2020	N/A	7 September 2020 (approved by CITES Secretariat)
Report by the Data Management and Statistical Analysis Specialist	20 October 2020[30]	20 November 2020	11 January 2021	22 January 2021	30 September 2021

[29] Section 4.3 of the Data Management and Statistical Analysis Specialist's deliverable notes an "*RMarkdown should be used to document the code. This creates a living document that links existing scripts together. The advantage is that an Rmarkdown document can be automatically updated as code fragments are updated. An RMarkdown is quite a technical instrument and it may be the case that only statisticians will be able to run it. On this purpose it is important to clarify whether the code's reproducibility is to be limited to statisticians only. CITES should clarify with which audience they would like to share the code.*"

[30] Input into Deliverable 2 was to be provided three weeks prior to consolidated preliminary report.

Deliverable 2: Preliminary Report on the Review of the ETIS Programme	10 November 2020	5 February 2021	5 February 2021	16 March 2021	02 May 2021
Deliverable 3: Final Report on the Review of the ETIS Programme	22 December 2020	26 February 2021	02 May 2021	10 August 2021	29 November 2021

4. Review Findings

4.1 Programme Governance

169. The ETIS programme's governance construct noted in Figure 1 in the Executive Summary and decision-making processes are effective, participatory, and founded on consensus building. Generally, accountability is well-defined, and responsibilities are followed through but not consistently, mostly due to lack of capacity, thereby diminishing the overall efficiency and responsiveness.

170. CITES Management Authorities are committed to meeting their long-standing reporting obligations outlined in Resolution Conf. 10.10 and other active decisions of the Conference of the Parties for the common goal of supporting elephant conservation under the Convention. However, capacity constraints and the perceived notion that reporting infractions may incriminate them and which could potentially lead to a trade ban, are hindrances to achieving ETIS's full potential. [31]

171. ETIS was developed by TRAFFIC and was later used by CITES as the foundation and standard for ETIS, subsequently enshrined in the Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens, making it unlike other engagements typically carried out for the CITES Parties, under contract by the CITES Secretariat. This decision was made by the Parties in full knowledge that TRAFFIC is an NGO with explicit conservation objectives. This arrangement is also unique among the biodiversity-related Conventions.

172. Some Parties have concerns with an NGO running/supporting ETIS since it is perceived to be an advocacy entity and may introduce implied biases in its supporting activities. However, TRAFFIC has close to a four-decade track record of demonstrating evidence-based analysis and recommendations on a wide range of sensitive wildlife trade issues. TRAFFIC's distinct positioning as a source of impartial information and advice on wildlife trade issues is central to its organizational identity.

> *"IT IS CERTAINLY A UNIQUE ARRANGEMENT WITHIN THE BIODIVERSITY CONVENTIONS. TRAFFIC ITSELF HAS STRONG CREDENTIALS AND SOUGHT OUT FOR ITS EXPERTISE. IT HAS ADVISED THE UNITED STATES FISH AND WILDLIFE SERVICE ON U.S. CONSUMER DEMAND ON THE ILLEGAL AND UNSUSTAINABLE TRADE OF WILDLIFE PRODUCTS."*
>
> **- INTERVIEWEE FROM PARTY CONSULTATIONS**

173. There is no doubt that TRAFFIC is passionate about and committed to contribute to the conservation of elephant populations, curtailing illegal trade of ivory and other specimens, and to biodiversity in general, which is what the CITES Parties would want

[31] Daniel W.S. Challender, Stuart R. Harrop, Douglas C. MacMillan (2015). Towards informed and multi-faceted wildlife trade interventions, Global Ecology and Conservation, Volume 3, Pages 129-148.

in an entity overseeing such a system. The overall analysis is data-driven and quantitative at its core. Furthermore, the data analysis is supported by indepth knowledge of the domain and associated qualitative information. Upon reviewing all the available documentation, correspondence (including responses to Parties' concerns), and an extensive number of conversations and interviews with TRAFFIC and ETIS stakeholders, and based on the totality of information and data digested as part of the review, the consultants find TRAFFIC to be objective in their use of available data, analytics approach, observations, and recommendations, which is overseen by the TAG and Secretariat.

174. Although a perception exists regarding a need for enhanced transparency, based on all the material reviewed, the CITES Secretariat and TRAFFIC have been forthright with providing to Parties all relevant information related to the operational and governance aspect of ETIS. The Parties' requests for information, explanation and further elaboration are addressed diligently. Any time lag to respond is reasonable considering the capacity constraints and competing priorities in supporting other MEA programmatic activities.

175. The effectiveness of the ETIS programme is assessed through the lens of analytics reports and outputs, and the resulting Decisions by Parties, and the actioning of these Decisions by the Parties - based on recommendations made to the Standing Committee by the CITES Secretariat. From a process perspective, as the system to provide the data and analytics required in support of the NIAP compliance mechanism, ETIS performs well based on the data available, however it should be actively and consistently informed by interaction with other agencies and experts.

176. The TAG, in its entirety, has been instrumental in providing support for the ETIS Programme. The Standing Committee appointed two seasoned veterans as statisticians, Mr. Andy Royle and Mr. Carl Schwarz, to address the need for analytics and statistical oversight. This should instill confidence in the Parties by ensuring that all the reports and analytics output are being reviewed and validated by an independent party.

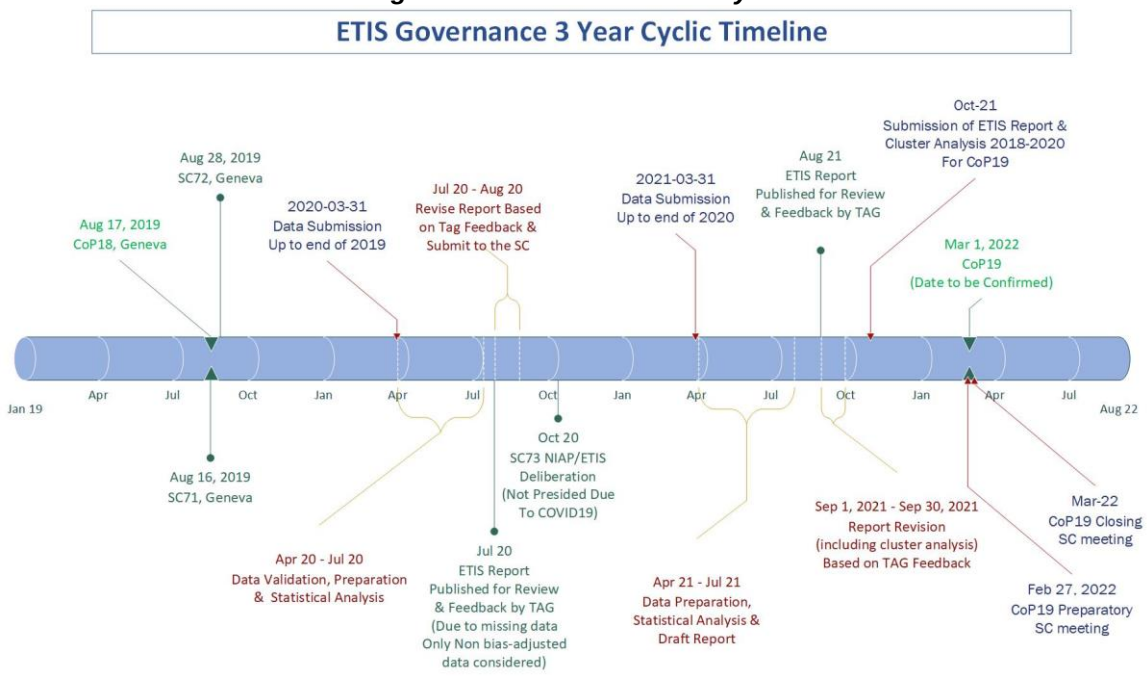
177. It is also understood that TRAFFIC will propose a candidate with extensive illegal wildlife trade experience and knowledge to the CITES Secretariat, to join the TAG in order to provide the illegal wildlife trade expertise, and to complement the current TAG members' extensive knowledge and expertise in statistics.

178. Most Parties, both elephant range States and other countries concerned about the survival of African and Asian elephants, fulfill their responsibilities to the CITES requirements. In Africa, countries that hold the greatest numbers of elephants especially Botswana, Zimbabwe, Namibia, Tanzania, and Kenya, for example have been very efficient in regularly supplying seizure data; ETIS reflects rather robust, long-term data sets for all of these countries.

179. Equally, many other non-range State countries, for example the US, UK, and Germany, also routinely provide comprehensive and timely data. These countries seem to be motivated by a keen interest in understanding the dynamics of illegal trade in ivory and supporting elephant conservation.

180. The three-year CoP and inter-sessional cycle from CoP18 to CoP19 and the key milestones are depicted in Figure 8 below. The time required to run the analytics and deadlines for data submission are of outmost significance to drive quality analytics results and fact-based discussions.

Figure 8: ETIS Governance Cycle



4.2 Supporting Processes

181. A primary ETIS consideration is the trade route associated with each seizure case; therefore, countries which rarely or never report seizures themselves can become implicated in illegal trade based on trade route data of illegal transactions provided by other nations. Simultaneously, known trade chains of particular seizures can be expanded based on subsequent forensic examination of confiscated ivory specimens that serve to identify the countries of origins of the ivory in question through DNA analysis and other methods. Hence, the forensic assessment is important, and its viability and dependability need to be verified.

182. One of the major concerns raised by Parties and reinforced during consultations with 15 MAs, is the assignment of the variable 'seizure out' (countries that are implicated as country of transit, origin, export) by the country of discovery. Over time, select countries have communicated their dissatisfaction with reliability and accuracy of seizure out determination. For further detail please refer to Section 5 and Annex C of the statistical report in Annex M.

183. A key ETIS metric for correcting bias in the data regarding trade chains is the Law Enforcement Effort Ratio (LE Ratio), which is a relative measure of how frequently

countries make elephant product seizures themselves vis-a-vis their total involvement in the trade according to the ETIS data.[32] In this regard, each seizure case each country makes and reports to ETIS in each year becomes an aggregated 'Seizure In' variable, whilst the number of seizure cases that are made and reported by other countries identifying the same country in the trade route becomes an aggregated 'Seizure Out' variable.[33]

184. The LE Ratio is calculated by dividing the 'Seizure In' variable by the total number of seizures in which a country was implicated (i.e., Seizure In / Seizure In + Seizure Out) to derive a measure of law enforcement effort. In this regard, countries that make more seizures themselves (i.e., Seizure In) than they are otherwise implicated in (i.e. Seizure Out) are believed to exhibit a good law enforcement effort. [34] This serves as an incentive for countries to report data on the seizures they have made themselves as it serves to improve their LE Ratio scores. Not reporting data on seizures has an opposing effect.

185. To instil confidence, the country reporting the seizure needs to validate and confirm its trade chain assignment with the countries being implicated. In the event of disputes, brokering and assignment of Parties being implicated by the discovery Party should be part of CITES' mandate and not TRAFFIC's, to ensure its impartiality. CITES needs to be more proactive to address disputes and assignment of Parties to the trade chain vertices, but in order to do so, CITES needs to be given access to ETIS data, subject to the availability of funding. Figure 9 and Figure 10 (both validated by TRAFFIC) outline the process flow for recording seizure records individually or as a batch. The 'Reviewed' and subsequent 'Validated' steps are prerequisites for marking the record as 'validated'. Repeated communication on the significance of trade chain and related system protocols for implicating countries and confirmation should be a common practice.

[32] Report on the Elephant Trade Information System (ETIS). CoP18 Doc. 69.3 - pg. 13.

[33] Understanding ETIS by TRAFFIC

[34] Ibid.

Figure 9: Entering "Single Seizure Record" Process Flow

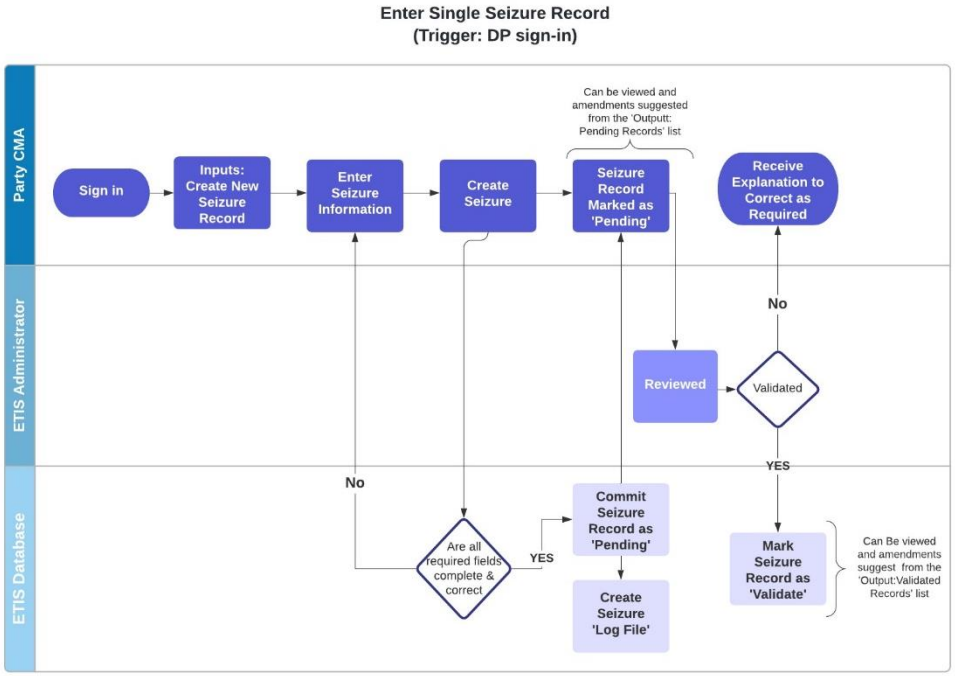
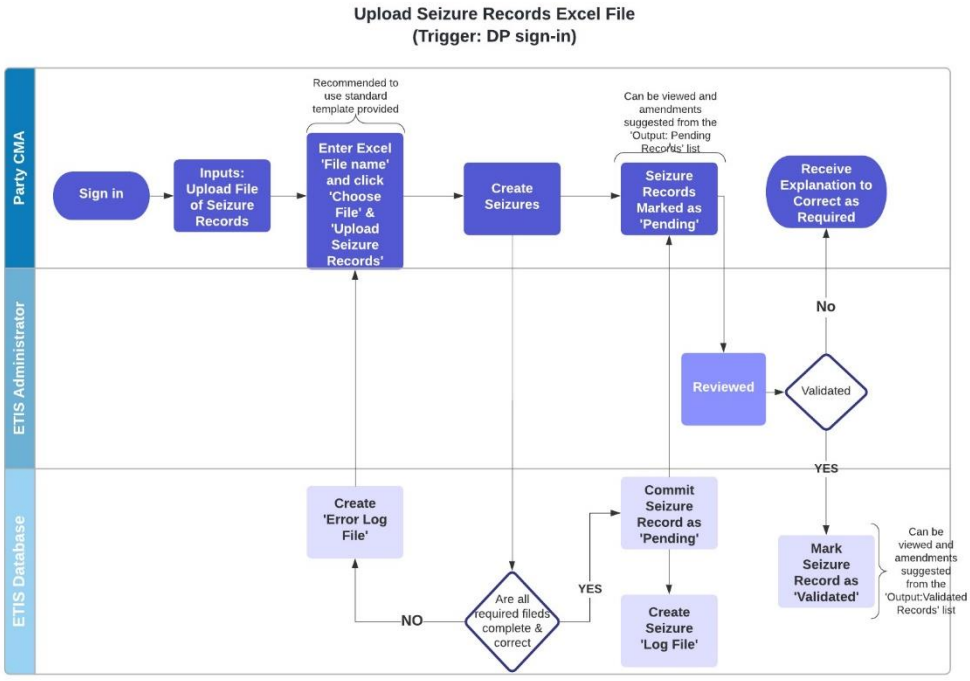


Figure 10: Entering "Batch Seizure Records" Process Flow



186. ETIS was chosen to serve as the enabling system to provide the data and analytics required in support of the NIAP compliance process. Moreover, the ETIS analysis to each CITES CoP is the foundation for identifying countries that might be included in the NIAP process. The NIAP process also appears to be an effective means of ingraining the CITES reporting requirements to ETIS via a parallel compliance process through the NIAP. However, the process to determine entry and exit into the NIAP process should not solely be based on ETIS results and its assertions. The CITES Parties, through the Standing Committee on recommendation from the CITES Secretariat, hold all decision-making powers. CITES - both at the level of the Standing Committee and the CITES Secretariat - need to play a more significant and hands-on role in augmenting the results with other information gathered from other agencies and countries to resonate diligence in care taken for NIAP process consideration and recommendation therein.

"ETIS WAS NEVER CONCEIVED TO SUPPORT A COMPLIANCE MECHANISM."

"IT IS NOT CLEAR TO PARTIES THAT ETIS IS ONLY IN THE FIRST STEP OF ANNEX 3. INDEPENDENT EXPERTS SHOULD BE INVOLVED IN THE ASSESSMENT AS TO WHETHER A COUNTRY SHOULD ENTER AND EXIT THE NIAP PROCESS."

"IN PRACTICE, WE DISCUSS ACROSS THE DIFFERENT UNITS WITHIN THE CITES SECRETARIAT BEFORE MAKING A RECOMMENDATION TO THE STANDING COMMITTEE."

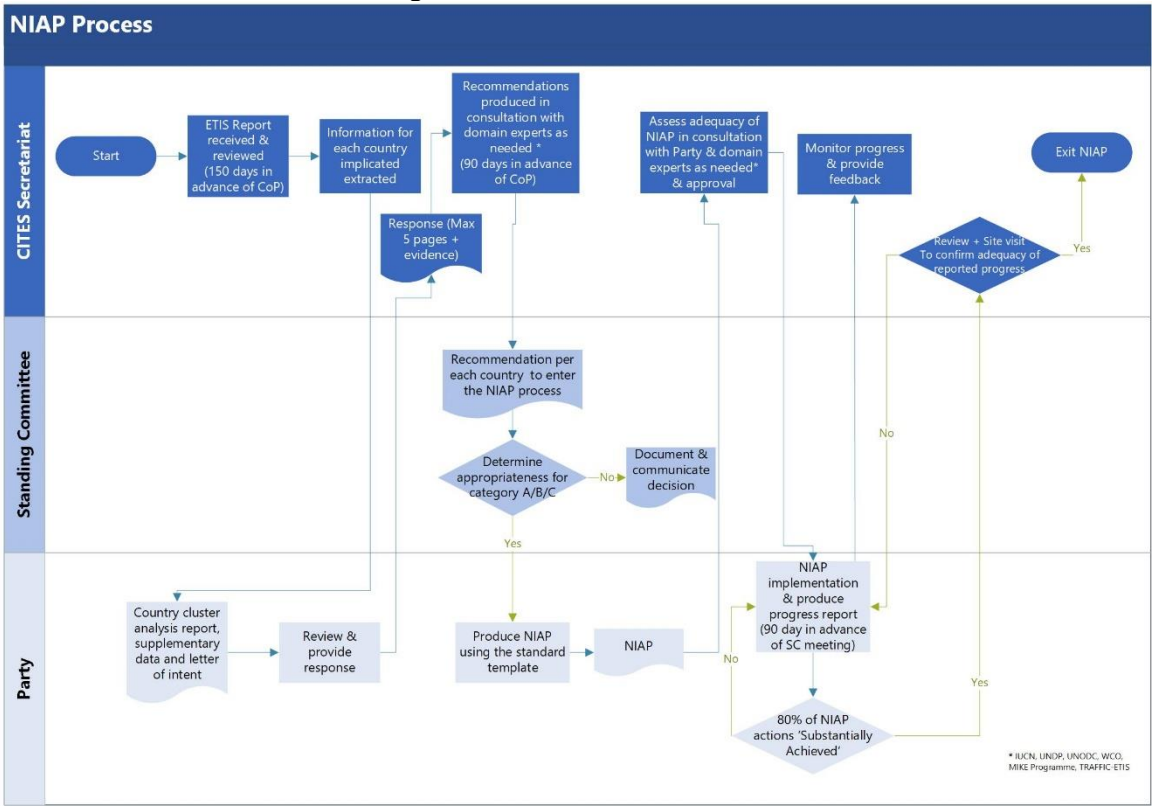
"WE ONLY HAVE 3 PEOPLE ASSIGNED TO CITES MATTERS IN THE ENTIRE COUNTRY. THE NIAP PROCESS COULD BE COMBINED WITH OTHER COMPLIANCE MEASURES."

"NEED TO MAKE SURE THAT NIAP (ELEPHANT AND IVORY TRADE SPECIFIC) AND ARTICLE 13 (BROADER RANGE OF ISSUES: ALL WILDLIFE) PROCESSES ALIGN."

- SOME RESPONSES FROM INTERVIEW QUESTIONS

187. Every year, all data for each NIAP-implicated country/Party is provided to the CITES Secretariat to review and validate and address any questions or concerns the Party may have. To assist with understanding of the end-to-end NIAP process, the process flowchart in Figure 11 was produced and validated with the Secretariat.

Figure 11: NIAP Process Flow



188. With regards to the supporting processes within ETIS, they are documented, however at minimum, the SoPs need to be made available to the TAG and CITES Secretariat, in addition to any updates to the notes already posted to GitHub. To further increase transparency, the already publicly-available ETIS code could be made accessible along with the aggregated ETIS data being part of the public domain. However, even with the ETIS code being publicly accessible, the Parties will have limited use for this code as the full ETIS dataset needs be made available as well to reproduce the results of ETIS.

189. The documentation available is extensive and comprehensive, but not organized or published consistently. Relevant information based on subject area are spread across multiple documents, updates to the supporting documents lag the implementation in some instances, and version control is lacking altogether. Currently the SoP is produced for TRAFFIC's internal reference. Production of a refined version of the SoP should be prioritized for external reference by stakeholders other than TRAFFIC. Knowledge management is paramount in instilling additional confidence in the supporting processes and how data and information is managed and arrived at. Relevant information ought to be collated in one singular document, updates should be provided at implementation and the documents need some proper form of version control.

190. Collecting comments and inquiries from the Parties and providing a response to either explaining why things are done in a certain way, or by adapting the ETIS-report

itself, is a common practice and effort intensive. Proactive, pre-emptive and frequent explanation and communication of the key concepts and processes would be more efficient and effective.

191. One of the common concerns expressed by Parties is they could not review the reports, digest the findings and contest them if needed in advance of the CoP and have their questions or concerns addressed before the presentation to plenary with all Parties. However, other Parties saw this as a manifestation of an NGOs independence and reflected that they were not influenced by Parties in providing an objective assessment. Still, prior distribution of the CoP report would allow the Parties to have the opportunity to privately raise their concerns and questions and hence the potential for the CoP meeting to be more productive. CITES ETIS support team needs to have familiarity with the content to be the first level support for these inquiries.

> "THERE HAVE BEEN INSTANCES WHERE WE RECEIVED THE COP REPORT AND COUNTRY SPREADSHEET PRIOR TO THE STANDING COMMITTEE MEETING PRECEDING A COP AND WOULD NOT HAVE TIME TO DIGEST THE CONTENTS AND FINDINGS BEFORE IT IS PRESENTED."
>
> **- INTERVIEWEE RESPONSE**

192. Regional forums should be leveraged as an opportunity to share information and lessons learned as has been done in the past. Forums such as the MIKE Subregional Steering Committee meetings with elephant range States and where ETIS sessions are also held, countries are able to learn about neighbouring countries' efforts in meeting their obligation to ETIS reporting, playing a positive targeted ETIS outreach role, and promoting more diligent reporting.

193. The discussions in the MIKE-ETIS Subgroup can at times be quite "engaging", especially on controversial issues, but these discussions are nonetheless a valuable and healthy element to the process to improve matters in case gaps or errors are identified. These debates should be conducted in an open and constructive manner; if problems are identified, the fact-based root cause should be determined, agreed upon, and appropriate solution(s) provided to remediate.

194. Some countries report confiscation as they have good information the shipment is illegal while other countries do not report domestic seizures, even though it is implied in Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens that these should be reported. The inconsistency in the recognition of the qualifiers for submitting a record introduces data quality issues. The qualifiers need to be clearly explained and expectations communicated to all Parties repeatedly and reinforced during training.

195. With respect to the qualifiers and nomenclature noted above, a "**Seizure"** is defined as taking over of actual possession of the goods by the department. Seizures can be made only after inquiry/investigation that the goods are liable to confiscation.

196. A "**Confiscation"** of the goods is the ultimate act after proper adjudication. Some country's law constitutes that a seizure must go through the proper regulatory and

inspection procedures before being officially reported and are governed by domestic laws for national/internal confiscation.

197. Consultations with Parties have surfaced different triggers for the reporting of ETIS data. For example, in one of the countries interviewed, the trigger is confiscation which only occurs if good information exists that the shipment is illegal. This country reports all confiscations (both national and international). It is important to note there are domestic laws for national/internal confiscation which supersede international commitments for domestic/national seizures. Another interviewee's domestic law constitutes that a seizure has to go through the proper regulatory and inspection procedures before being officially reported, while another Party's law dictates they do not report domestic seizure (since it is national and not international), although there is recognition that national seizures should be reported as well. There are multiple Parties that only report international seizures and not domestic ones.

> "IN MY COUNTRY, THE FIRST ENTITY/PERSON WHO CONFISCATES MAY NOT BE THE SAME AS THAT WHO INVESTIGATES THE CASE. WE NEED A STANDARD OPERATING PROCEDURE SO THAT THE FIRST RESPONDER IS THE ONE REPORTING THE SEIZURE."
>
> **- INTERVIEWEE RESPONSE**

198. Training is one of the key areas that TRAFFIC can improve on going forward. In the past, TRAFFIC has developed publications and presentations. For example, TRAFFIC noted that it produced a modular training package, which was translated into 15-16 languages; from a one-hour PPT to a 3-day workshop that described the end-to-end process and ETIS' data fields for form entry. Nonetheless, funding needs to be allocated to enable TRAFFIC to provide both passive (recorded) and active (scheduled and participatory) online training, especially considering the new release of the ETIS Online. It should also be noted that as of March 2021, TRAFFIC has developed a dynamic presentation on ETIS data collection and modeling, as well as use of ETIS Online which was presented to Botswana, and Zambia upon request, and Africa-TWIX (including Burundi, Cameroon, Central African Republic, Democratic Republic of Congo, Republic of Congo, Gabon, Rwanda), and is scheduled to be presented before the SADC-TWIX on 19 April 2021 (including Angola, Botswana, Lesotho, Malawi, Mozambique, South Africa, Zambia, Zimbabwe).

4.3 Sustainability

199. The findings in this section are presented based on four relevant considerations. As such, there may be some degree of overlap between this section and the previous section on 'supporting processes' as the latter are enablers of sustainability.

4.3.1 Stakeholder Value to Drive Organizational Design, Strategy and Services

200. Stakeholder value is reflected by fulfilling the objectives set for ETIS in Paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens. To instill

stakeholder confidence, there needs to be monitoring mechanism to evaluate whether these objectives are met.

201. A set of practical Key Performance Indicators (KPIs) to track against the progress in meeting the objectives would be instrumental and ought to be considered and agreed upon to be included in future agreements / Statements of Work with TRAFFIC[35]. While there is no defined "ETIS team" within the CITES Secretariat; there is a loose affiliation and informal support network of CITES resources that play a role at different junctures of ETIS. Formalizing the organizational design to include a new CITES ETIS "team"[36], together with recent TRAFFIC ETIS team changes, would reinforce stakeholder confidence and consequently, provide the backing required to sustain the ETIS programme.

4.3.2 Business Continuity of Operations Systems and Supporting Processes and their Continuous Improvement

202. ETIS is the central component of the programme. Continuous support and improvements, and system enhancements are key elements that would drive programme sustainability. A stable, viable organization with the expertise and knowledge required to support ETIS is fundamental.

203. Since its inception, with funding from various sources/key donors, ETIS has been designed, supported and enhanced by TRAFFIC. Considering the funding constraints and uncertainties, TRAFFIC has done a good job in advancing ETIS. TRAFFIC has leveraged its resources and footprint across the globe to fulfill its obligation in relation to ETIS programme.

204. To strengthen the ETIS programme's sustainability, two main challenges will need to be overcome; one organizational and one technical:

- The organizational challenge is the need to strengthen existing – or put in place novel – institutional arrangements for sharing information, knowledge management and training, and ensuring the efficient management of ETIS;

- The technical challenge relates to the database and online platform development, or modification of existing national government information systems and websites for information management and dissemination.

205. It is prudent to consider alternative options for the management and operation of a potential new platform for ETIS. The timing for this consideration would be best placed when a research initiative to explore alternative or augmentative statistical techniques to the current model is considered. Once alternatives are evaluated for viability and robustness, to implement the new methodology would require development of new algorithms (using R, or other enabling software). Some of the

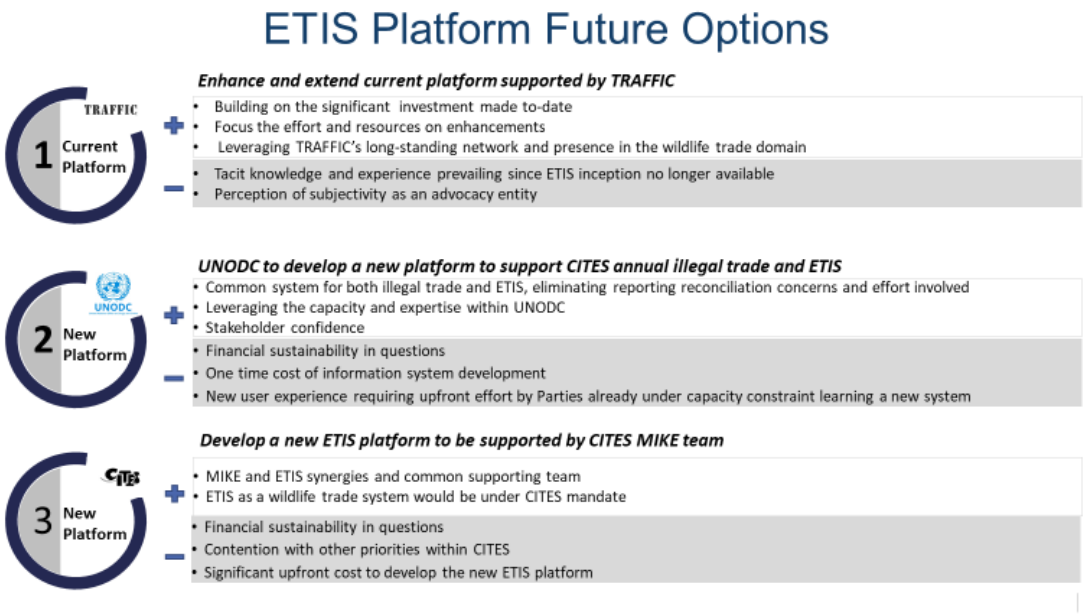
[35] At most two KPIs per objective, that can be easily measured, is suggested.

[36] At minimum, it is recommended to establish a 'CITES ETIS Coordinator' role as the lead CITES focal point to work closely with TRAFFIC, orchestrate content reviews (and approvals) between different governance structures and to address Parties' procedural/data disputes.

initial cost of standing up a new ETIS platform can use the synergy presented by the research initiative.

206. Three of the most feasible options for a possible future home of ETIS have been outlined in Figure 12 with associated pros and cons. The options are listed in order of most to least feasible/practical.

Figure 12: ETIS Future Home Options



4.3.3 Capacity Building Through Skills Development and Capability Enhancement

207. Technological solutions present the pitfall of temptation to develop structural and functional complexity way beyond the available resources and what is realistically needed to manage the number of records within ETIS. However, solutions are required for delivering the functionality needed and expected from the CITES Secretariat, in line with the objectives and the scope of the system. TRAFFIC's performance in this regard has been a balanced approach.

208. The operation of the ETIS is guided by the capacities of the different stakeholders contributing and managing information, the architecture of existing information systems upon which the ETIS is built, and the type and availability of the information itself.

209. System capability has been upgraded with the recent release of ETIS Online. There are planned enhancements which are being prioritized based on significance, cost of implementation and funds available. A list of short-term (2021) and long-term (2022+) activities, to be undertaken by TRAFFIC, are outlined in Annex H. Sharon Baruch-Mordo brings the requisite skills and knowledge to fulfill these tasks by TRAFFIC vs. reliance on the outsourcing model leveraged in the past. The skills developed and experienced gained is retained within TRAFFIC, a key driver for

sustainability.

4.3.4 Leveraging Knowledge and Information to Determine Areas for Improvements

210. Explicit and implicit knowledge can be easily documented and articulated, so it can be shared and applied. By having a comprehensive, succinct and current set of supporting documents, TRAFFIC can ensure information and knowledge is retained and transferable easily in the event of staff turnover or new staff assignments.

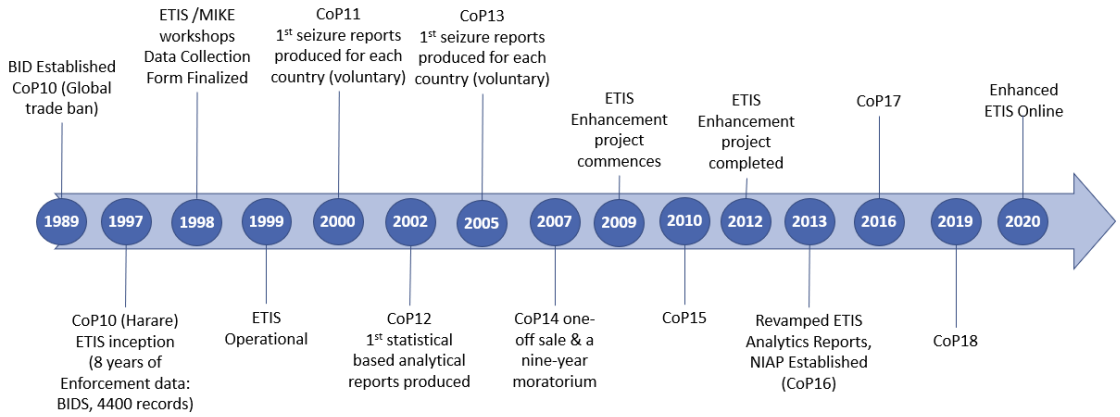
211. On the other hand, tacit knowledge is gained from personal experience, is difficult to document and replicate. The ETIS Director's departure creates a tacit knowledge void. His in depth understanding and knowledge of the illegal ivory trade honed over many years, and his extensive network of relationships to tap into for information - that would otherwise not be available - have all been instrumental to the success of the ETIS programme to date.

212. Even though the ETIS Director's tacit knowledge cannot be replaced easily a concerted effort to plan towards the future sustainability of ETIS should be undertaken, and TRAFFIC ought to introduce a mentorship construct for tacit knowledge sharing and experiential learning through job-shadowing. However, like many sustainability solutions, funding and capacity are the main constraints towards implementing such a mechanism. It is noteworthy that TRAFFIC has made provisions in the budget for both the former ETIS Director and the statistician consultation with the analysis, which will facilitate knowledge sharing and transfer.

213. As described in the preceding section, by having recruited an experienced analyst, TRAFFIC has secured in-house knowledge required to undertake many of the enhancements and address a number of concerns raised by the Parties regarding the methodology. Other improvements, which may not have been previously apparent, may come to light as further knowledge is gained through undertaking these enhancements. This self-enhancing capability through acquisition of knowledge is an enabler for ETIS programme's sustainability. Moreover, the tacit knowledge retainment through job-shadowing needs to be considered by TRAFFIC with the recent changes in the organization.

214. Holding the CoP approximately every three years, in addition to the intersessional Standing Committee meetings, provides the setting for an optimal exchange of information, sharing of knowledge and lessons learned. Figure 13 depicts the chronology of CoP sessions and ETIS' major milestones.

Figure 13: ETIS / CoP Chronology



4.3.5 Financing Framework

215. The financial framework needs to ensure the minimum financing required to maintain ETIS to keep the system running, respond to user enquiries, support collection and validation of data submitted, and address data anomalies.

216. Funding for initial system development was a grant from the Darwin Initiative. The money was allocated to Reading University where statisticians worked with TRAFFIC to develop the first iteration of the ETIS. Since then, the funding from contributions by various governments, for enhancements and improvements has been inconsistent. The latest development initiative (SC69 & 70) was financed through voluntary contributions by Belgium, Germany, the Netherlands and United States. The programme is also currently funded by the European Commission.

217. The budget estimate for minimum funds required to support and maintain ETIS until the end of 2023 is reflected in Table 8. In addition to the resources required to keep ETIS running, the annual budget includes the following:

a. ETIS platform (database and application) maintenance and support;
b. Travel for regular meeting of SC, TAGs and Steering Groups for which at present is not anticipated whilst COVID continues to prevent travel;
c. Travel expenses for additional trips to regions/countries to discuss ETIS results and processes and advise on capacity building.
d. New, with the launch of ETIS Online: shifts in responsibilities in relation to data provider approval from the CITES Secretariat to TRAFFIC, as well as additional improvements and tracking systems → increase in required minimum funding from 2021 onwards.

Table 8: ETIS Annual Run Rate "To Keep the Lights On"

	Estimated Fiscal Budget			
Description	2020	2021	2022	2023
Minimum Funding Required	USD 220K	USD 300K	USD 300K	USD 300K

218. Through the European Union, the MIKE programme will cover USD 100K per year towards the minimal budget over the 4 years period. Moreover, TRAFFIC has secured additional funds from the governments of the Kingdom of Belgium, Federal Republic of Germany, WWF-Germany and WWF-UK and are continuing to raise funds on an ongoing basis to meet the shortfall. The CoP years are more resource intensive. Currently only the grant secured from Germany will contribute to ETIS until the end of CoP19.

219. Another comparative budget exhibit is reflected in CoP18 Doc. 69.3 (Rev1), Annex 4: the estimated budget for the implementation of ETIS (2020 – 2023) depicted in Table 9 below. Some provisions have been made for ETIS in the proposal submitted to the European Union for the next phase of the implementation of the MIKE programme. However, some of the costs reflected in the budget proposal submitted for the MIKE programme, are not provisioned for, therefore additional funding needs to be secured to cover the total cost associated with the ETIS programme (shortfall of approximately USD 280,000).

Table 9: Budget for Implementation of ETIS (2020-2023)

Result area	**Budget**
The operational integrity of ETIS as a world class monitoring system tracking illegal trade in ivory and other elephant products is maintained.	USD 360,000
An on-line ETIS website for the benefit of the CITES Parties in two languages is maintained.	USD 100,000
Monitoring techniques, research protocols and analytical methods for understanding the drivers, trade routes, markets and other related factors behind illegal trade in elephants and elephant products are refined and/or developed.	USD 218,000
Analytical results, data and information from ETIS to support decision making for, and foster awareness and understanding of, elephant product trade is produced, disseminated and communicated.	USD 202,000
Total	**USD 880,000**

220. Online education, training, and seminars have gone mainstream, especially in the context of the COVID-19 global pandemic. This also offers an additional benefit of reducing travel, conference, training, translation and entitlement expenses which can be prohibitively expensive for global MEAs. To this end, training activities should target, primarily, Data Providers of the ETIS and select CITES ETIS supporting team members. Additional investment in capacity building, would also help traceability to achieving objective (iv) in Paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens.

221. The minimum funds required to maintain and support ETIS is reasonable and comparable, in terms of “order of magnitude” from a system perspective, to funding

requirements for applications of a similar scope[37]. Table 10 outlines the estimated cost for UNODC to develop and support an information system in support of Annual Illegal Wildlife Trade Report.[38]

Table 10: Estimated Cost to Develop and Support of Annual Illegal Wildlife Trade Platform

One-time costs		
Contractual services for development of new data platform (consultant) (4 months).	24,000	-
Sub-total	*24,000*	-
Recurrent costs		
Statistical Assistant for overall data management (see detailed list of tasks in Annex 1 to this proposal).	111,200[6]	113,800[4]
Statistical expert to maintain supervision of the entire process (2 months).	27,783[4]	28,383[4]
Standard costs for data storage, maintenance and dissemination, including support costs for database backup and recovery.	12,500	9,540
Support cost to UN Environment-WCMC to help ensure that nomenclature reference and data standards are applied as for the annual trade report and to be compatible with the CITES legal trade database.	9,500	9,500
Annual meeting with CITES Secretariat, covering two-day mission of three staff members from Vienna to Geneva (or viceversa).	4,000	4,000
Sub-total	*164,983*	*165,223*
Project Net Total	***188,983***	***165,223***
PSC (7.0%)	*13,229*	*11,566*
TOTAL	**202,212**	**176,789**

Total for the first two years: **USD 379,001**

222. Activities which are supported through the core Trust Fund are more stable than those which depend on fundraising and additional voluntary contributions from individual Parties such as Germany, Netherlands, Denmark, etc (i.e., in the case of the MIKE programme which also allocates funds to the ETIS programme). Given the global economic downturn as a result of COVID-19 and the funds that have poured into revitalizing economies around world, the consequence of shifting priorities poses a financial risk for ETIS going forward and hence, the significance of contributions to the core Trust Fund to minimize financial risk and ensure ETIS' sustainability.

223. TRAFFIC has been remarkably successful in raising private sector funds in support of the ETIS programme, thereby diversifying funding streams. Its efforts to date have been a hedge against financial risk considering the real potential for reduced contributions from Parties and traditional government sources of funding going forward. With assistance from the CITES Secretariat, resource mobilization efforts going forward should vigorously target the private sector (specifically the technology sector) and philanthropic organizations and private foundations. From a marketing / resource mobilization perspective it may be more enticing for the private sector to contribute funds towards ETIS by leveraging messaging around curtailing the illegal killing of elephants as opposed to the illegal trade in ivory; which is less appealing, is difficult to resonate, and does not pull at the heartstrings as much. From this point of view, it may be advantageous for ETIS to dovetail on the MIKE programme's efforts to raise funds.

[37] Recognizing the scope of the UNODC database is broader and includes a wide variety of species reported by Parties.

[38] https://cites.org/sites/default/files/fra/cop/18/doc/F-CoP18-036.pdf

224. Considering the real potential for reduced contributions from Parties, resource mobilization efforts should also vigorously target securing funds from the private sector (such as the technology sector) and philanthropic organizations and private foundations.

225. Beyond the minimum funds required to keep ETIS running, further financing is needed to enhance capacity and drive continuous improvement by leveraging knowledge and information gained. ETIS is operating with shoe-string budget and minimal resources. Ongoing capacity building is needed during the stepwise development of enhancements, features and functionalities.

226. A potential source of funding to be considered is a mechanism for cost recovery based on data/services/consulting provided (i.e. with Interpol). Further collaboration and exploration of cost-sharing agreements amongst global agencies with overlapping organizational objectives and mandates, such as the World Bank, UNODC, WCO, Interpol and CITES, need to be considered to enable a funding mechanism to support of combating Illegal Wildlife Trade as a whole, including ETIS.

227. Traditionally, the financial resources for core activities of MEAs come mainly from national public funds dedicated to the creation and management of MEAs, from bilateral government sources or regional (European Union and UNEP) funds. These are also augmented through voluntary contributions for specific programmes not covered in the core budget and "pet" projects funded by specific governments to advance specific areas of conservation interest. These funds are generally unpredictable, short-term in nature and highly irregular.

228. Therefore, and in a context where budgets tend to be strained, including for ministries of environment and major MEAs, the development of sustainable funding mechanisms is of particular importance. Supporting and developing regional, national and local financing mechanisms has become essential to mobilize complementary and diversified funding sources in order to improve the effective management of essential programmes not covered by core budgets in the long run.

229. For ETIS a hybrid mechanism, over and above the current state situation of voluntary contributions, could also be considered encompassing an endowment fund, a sinking fund and a revolving fund that contribute to support both minimum "keep the lights on" activities and other system enhancements and capacity building:

- **Endowment Fund:** The capital of the fund is invested on a long-term basis on the international financial markets, and only the proceeds from the investment are used to fund grants and biodiversity conservation activities;
- **Sinking Fund:** All capital and investment incomes are disbursed over a fairly long period until they are fully spent for specified actions;
- **Revolving Fund:** Income from donations which are earmarked for the CITES Trust Fund regularly replenishes the Fund to be used for specific actions.

230. Securing funding from the private sector, from foundations and philanthropic organizations can be problematic and present its challenges for UN organizations who are not readily equipped to vet and accept funds from these entities using traditional

financial vehicles. Against the backdrop of COVID-19, governments around the world have introduced stimulus packages pouring trillions of dollars into initiatives to help revive their economies and recover from the impacts of the pandemic. As such, government funding for conservation will likely be stretched for quite some time; this does not bode well for ETIS.

231. While there is no silver bullet to solve the financial sustainability of ETIS, diversification in funding sources is key and the programme should not shy away from embracing non-traditional models and sources of funding because of thorny issues. A number of UN entities have forged partnerships with the private sector to fund conservation initiatives; the Lion's Share Fund is one recent and effective example[39].

232. For any enhancements / improvements (non-core administrative costs) of ETIS moving forward, there are three main pillars and governance requirements:

i) change requests should be logged, costed and prioritized by the TAG and subsequently vetted by the Standing Committee to ensure the availability of funding, and upon approval, formal communication of planned changes to all ETIS stakeholders;

ii) for the provisioning of additional funds for any improvements or enhancements for which there is insufficient funding, the recommendation is to place more emphasis on the private sector and philanthropic contributions. Moreover, to alleviate legal obstacles for the receipt of private sector contributions, a legal expert should be procured to propose (and set up) an appropriate legal framework for establishing an appropriate international fund;

iii) a dedicated marketing campaign for ETIS targeting the private sector (i.e. including technology firms), leveraging messaging linked to the illegal killing of elephants (as opposed to illegal ivory trade) to promote non-traditional sources of funding. An experienced private sector / resource mobilization consultant should be procured for the development and implementation of a Sustainable Financing Framework, including both a resource mobilization, private sector engagement strategy, as well as the necessary legal due diligence for establishing any required frameworks for preferred options.

233. At minimum, a Sustainable Financing Framework should include (a) basic and optimal costs of ETIS improvements / enhancements for which there is insufficient funding once TRAFFIC's short- and medium-term activity plan is reviewed prioritized by TAG and funding earmarked by the Standing Committee; (b) economic and market overview; (c) competition analysis; (d) business development strategy; (e) financial analysis and resource requirements; (f) investment priorities; (g) mapping of sources of finance, and; (h) revenue generation strategy. This overarching strategy – to be approved by TAG and subsequently the Standing Committee - should also identify new and innovative fund-raising mechanisms relevant to ETIS such as business investment partnerships.

[39] The Lion's Share Fund is co-founded and fully supported by the UN Development Programme who manages the fund and conservation impact through its vast network of NGOs, civil society and governments on the ground worldwide.

4.4 Data Governance

234. The ETIS programme does not explicitly address data governance. However, the main activities of data governance such as data, information, and analytics, mandate in support of the 'monitoring of illegal trade in ivory and other elephant specimens' are mainly outlined in the Resolution 10.10, and its supporting Annexes. More specifically, Annex 1 serves as the data governance policy document, outlining the data, information and analytics scope, and data management activities such as data collection and key responsibilities.

235. Supporting, tracking, and overseeing the delivery and operational execution of the ETIS programme are clearly defined and thoroughly communicated, and all the supporting documents are available for download from the CITES website.

236. A "Data Use Agreement" has been agreed upon by the MIKE-ETIS Subgroup, clarifying under which conditions certain data could be released for research purposes. Yet, definitions of data ownership and stewardship, which is standard best practice in Data Use Agreements, are neither explicitly defined, nor emphasized and well-communicated therein.

237. Seizure records submitted by the Parties constitute their ownership of this data. As the data owners, the CITES Parties need to agree on what information is provided, how it is used, and any standards to be applied.

238. To establish a sound information governance regime, it is recommended that the ETIS-MIKE Subgroup review the mandates related to information sharing, as well as other regulatory requirements associated with confidentiality, transparency and sensitive data, and refine as deemed necessary.

239. An explicit data sharing policy in the Resolution 10.10 similar to the 'Conf. 11.17, National Reports, paragraph 4', but more comprehensive of data governance discipline, should be included:

> "*AGREES that, unless otherwise specified by the reporting Party, data collected in the annual illegal trade report and included in the database should be made available to Parties for research and analysis of wildlife and forest crime as it affects them, and to the members of the International Consortium on Combating Wildlife Crime (ICCWC) for ICCWC global research and analysis studies on wildlife and forest crime.*"

240. The 'annual illegal trade report' data submission form includes selection boxes (yes/no) for the Parties to consent on whether the information provided can be shared with ICCWC. A similar feature could be introduced in ETIS to enable data sharing with other agreed entities, subject to the availability of funding, for both online form-based data entry or a batch upload to an Excel file. The ETIS-MIKE Subgroup and the CITES Standing Committee would need to determine which agencies should be included in this selection.

241. Frequent and targeted emphasis and insistence on the reliability of data submitted would enhance the quality of the analytics results. ETIS data has the following attributions:

- **Integrity –** The contextual nature of the seizure data and Parties' challenges with reporting undermines data integrity. Earlier in the data lifecycle data is less reliable (completeness) and trustworthy (i.e. implicated countries not confirmed yet). Data quality management protocols further down the lifecycle improve on the data integrity for subsequent consumption in the analytics phase.

- **Transparency –** Validation is an important element of transparency, with an emphasis on the processes that leverage online data submission by a country's data provider, enabled and further enhanced in the new release of ETIS Online. ETIS data is collected using broad multifaceted processes outlined later under data management.

- **Consistency –** Setting timelines for reporting can help ensure consistency and comparability across countries, and across years within countries.

- **Accessibility –** Information should be made available as outlined by information governance and access policy. Promotion of public access to as much of the data as reasonable, and agreed upon by the standing committee, would promote research-based activities resulting in consideration of more robust statistical models. EITS' multi-language availability helps increase accessibility.

- **Flexibility –** Need to have flexibility to submit the seizure record all together, once a year like the protocol provisioned for the 'annual illegal trade report' data submission. ETIS data quality management processes have evolved and improved as lessons have been learned.

4.5 Data Management

4.5.1 Data Acquisition and Preparation

242. ETIS provides several standard tools for an information system such as templates, data entry forms, modules for data quality management, analytics and reporting, and the supporting database for compilation and management of Elephant Trade Information and related analytics and reporting.

243. Templates and the user interface promote standardized compilation of information and can support information processing and facilitate entry into a database. Moreover, ETIS provides the protocols that indicate who (which country or stakeholder) is reporting, what (scope of information), when (periodicity), how (template or form to capture the information), and through which channel (e.g., physical documents or online system).

244. Receiving good data is extremely important in securing and underpinning robust results from the system that can inform decision-making, i.e., an accurate, timely, relative reflection of the illegal trade in elephant ivory in terms of a holistic understanding the global scale of the trade, key players, the most important pathways of movement and other relevant dynamics.

245. Subsidiary data are acquired by TRAFFIC through external sources, such as Transparency International for 'Corruption Perception Index (CPI)', or derived measures such as 'Mean Market Score' that are based on data acquired by TRAFFIC through market scans, NGOs and other viable sources. This dataset is leveraged either directly in statistical modelling, or indirectly as complimentary data and information to explain the output from the cluster analysis. Both these uses are contextually appropriate and significant in supporting the illegal ivory trade analysis with its sparse and small seizure dataset. However, a governance oversight by the TAG would instill confidence in the resulting inclusion. For further detail on the CPI and Mean Market Score, please refer to Section 6 of the statistical report appended in Annex M.

246. Moreover, ETIS maintains a series of subsidiary information on:
- law enforcement effort and efficiency,
- rates of reporting,
- legal and illegal elephant product markets,
- governance issues,
- background economic data and other factors.

247. Another data source is regular Market Surveys (~200 surveys) conducted by TRAFFIC and the data (compiled in the form of country reports). The recurring, enabling governance oversight by the TAG for inclusion of any data including the Market Surveys should apply in this context as well. TRAFFIC has the oversight responsibility for the surveys.

248. Relevant open-source data is captured by ETIS. The ETIS System Administrator follows up with the implicated Party MA to verify the open-source seizure data. The challenge for some of the MAs is that they have no ivory seizing responsibilities themselves, and are not empowered as law enforcement body to make seizures; so for them to validate seizures they would have to contact customs or police or another law enforcement agency for the country.

249. The source of information and underlying data, and method for derivation of measures are clearly outlined in the SoP and the augmentative documents, and the CoP reports. As indicated previously, currently the SoP is produced for TRAFFIC's internal reference. A priority should be given for production of a refined version of the SoP for external reference by stakeholders other than TRAFFIC. Moreover, the SoPs need to be shared with the CITES Secretariat and the TAG, and any non-proprietary content published for access by the Parties.

250. In 2020 TRAFFIC was unable to run the trend due to insufficient data. In January 2021, the CITES Secretariat sent out Notification No. 2021/011 reminding Parties to

report every seizure of illegal elephant ivory and other elephant specimens made within their territories to the Elephant Trade Information System. The Notification also requested Parties to submit any 2020 ETIS data by 31 March 2021, including those for 2018, 2019 and 2020 to ensure that data from such reports can be included in the upcoming analysis of ETIS data for SC73. However, in preparing the report for SC73, TRAFFIC has encountered the same data reporting shortcoming by a number of Parties. Unless the Parties provide data to ETIS, TRAFFIC cannot produce quality, science-based estimates of trends.

4.5.2 Data Quality Management and Validation

251. Ongoing management of ETIS would benefit from the review of the quality, reliability and validity of the information compiled, analyzed and interpreted. Quality assurance and validation can occur at three points in the ETIS operations, depending on the type of information collected and whether it has already been validated (e.g. if the information was taken from official statistics).

252. The first entry point for quality assurance is when the information is collected. Spot tests can be performed to assess the accuracy of data or a statistical analysis can be run to identify patterns that may indicate the information is skewed. The second entry point for quality assurance and validation is when the information is submitted to the system. TRAFFIC cross-checks information from different sources, compares information collected at different sites, or reaches out to key stakeholders or institutions, in addition to the information providers, to assess the quality and reliability of the information.

253. Information quality is likely to be more robust if it comes from official or other reliable sources that apply sound methodologies and processes to address data integrity. Quality assurance processes should also consider the use of different sources of information, where relevant and available, such as information coming from non-government institutions, like media, sources on the ground or NGOs. Such information can help to complement other information sources. Credibility of the source for the data (i.e., A, B, or C) needs to play a role in the analytics. This is one of the pending items in TRAFFIC's development plan (Annex H) to be addressed by comparing the analytics results with and without considering categories B and C.

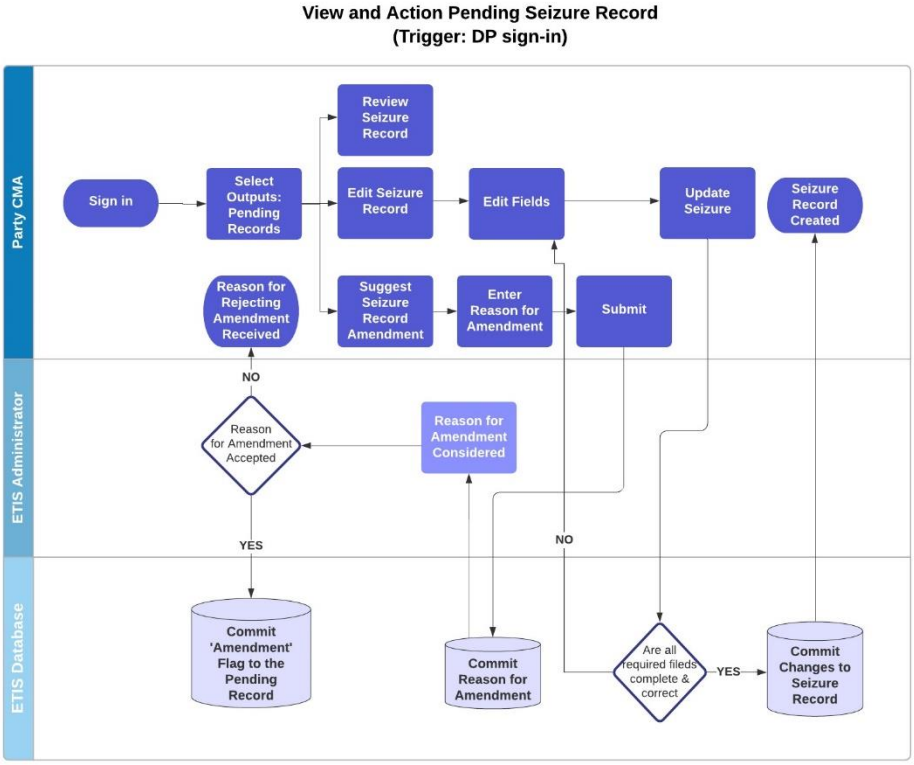
254. The final step of quality assurance and validation, to check whether conclusions drawn from the information are sound, occurs when the information has been processed and interpreted`. At this stage, validation is sought to ensure the accuracy and robustness of the interpretation of the information, i.e., to understand whether the analysis reflects the reality on the ground. Approaches to obtaining stakeholder validation could include consultative processes such as meetings and workshops, surveys, and online public consultation. A multi-stakeholder working group can be useful in coordinating various stakeholder inputs to the validation process.

255. TRAFFIC does make a reasonable effort to validate the data it receives from official government agencies. The challenge and a significant bottleneck to data quality is that in most cases TRAFFIC does not hear back when validation inquiries are made. When possible TRAFFIC attempts to validate data through their own channels and

contacts with the Parties' customs or other law enforcement agencies (nurtured over many years) to validate the information. In such case since the seizure is validated with an official body it is recorded as such. If there is ever any discrepancy between the data received and official government agency data, the latter is taken and recorded as official data in ETIS.

256. ETIS Online provides a rich workflow for validation and approval of a pending seizure record as result of request to be reviewed, edited or removed as reflected by the process flowchart in Figure 14.

Figure 14: Validation and Approval of a Pending Record Process-Flow



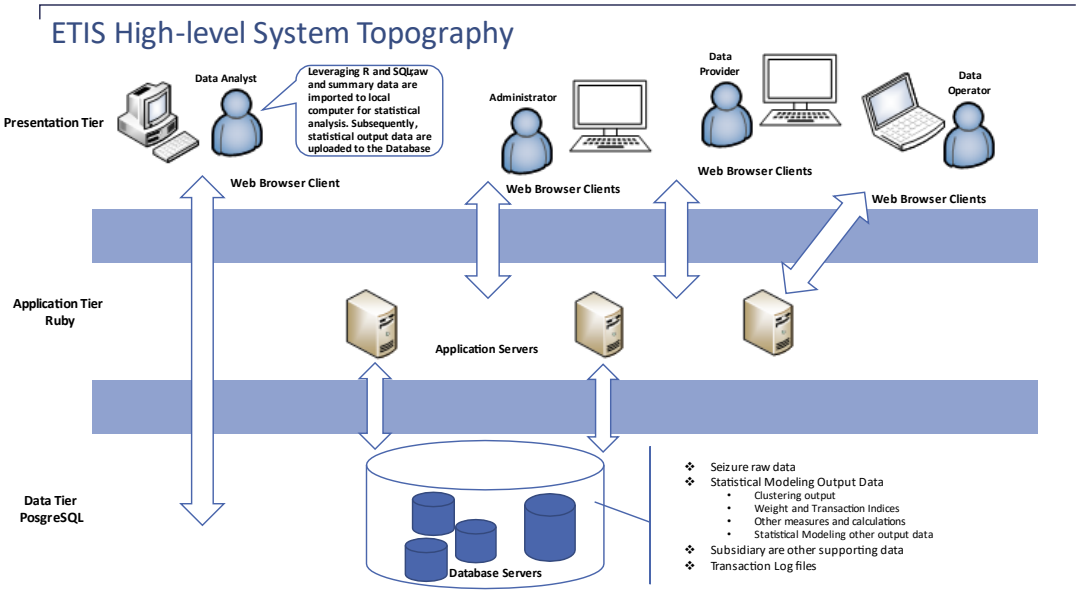
257. In the past 20 years there has been less than 5 cases that the country/Party has disputed the reported seizure data; a reflection of rigor that goes into validating the data.

4.5.3 Database and System Management

258. The ETIS platform was initially developed and maintained by Solertium Corporation in 2010 under the Darwin Initiative funding. Vulcan Labs took over in 2015 until the end of 2020. TRAFFIC has a new service agreement with S-Branch for the ongoing support and maintenance, and development of the ETIS platform. S-Branch have been assisting with additional functionality of ETIS Online. Security, privacy and identity, and access management health-checks were completed by S-Branch and immediate fixes have been implemented. Additional identified improvements are being

worked on currently to improve system functionality to the administrator and data providers. The infrastructure architecture is reflected in Figure 15.

Figure 15: ETIS High-level Infrastructure Architecture



259. The new ETIS platform allows authorized government representatives to access and more easily submit records on elephant specimen seizures in their respective countries. For example, Parties can view and download their data used in ETIS analyses, which details the number and weight of seizures made within the country as well as seizures in which their country was implicated by other Parties or from other sources, such as WCO.

260. ETIS has a solid regiment for business continuity and disaster recovery. The ETIS servers are in a datacentre in Cambridge, England, while the backups of the server are stored in a London datacentre as the disaster recovery site. Database backups are taken every 6 hours. Data retention protocol consist of 7 daily backups, 4 weekly backups and 4 monthly backups. These backups are a snapshot of the database and critical to reproducing the analytics results retroactively. Each version of a published report is based on a snapshot of the ETIS database on which the associated analytics are based. This practice enables regeneration of the same results when the codebase for a reporting cycle is re-run against the associated database snapshot by another stakeholder.

261. ETIS provides a comprehensive audit log functionality. Any action (CRUD: create, read, update, delete) on the data is recorded both at the system level by the Database Management System (DBMS) and at the application level with reporting functionality.

262. System change management and release management practices are not robust and formal. Request for changes from all stakeholders need to be logged and suggested 'importance' and priority assigned. The change request list will then need

to be reviewed annually, by the TAG, and upon their approval, with the Standing Committee (through the MIKE-ETIS Subgroup which is responsible for making recommendations on operational and financial sustainability issues of the programme) and prioritized for implementation the subsequent year considering the funding envelope available. The plan for the implementation of the changes and the associated schedule needs to be communicated with all the stakeholders. Next, the changes to be implemented that year need to be packaged as one main change request to be developed, tested, supporting documents updated, and training materials produced as required.

4.5.4 Information and Data Dissemination and Access Control

263. Building or strengthening information-sharing agreements that span as many countries as those Party to CITES often represents a challenge for system operation, as this process can require a significant amount of time, effort, and political buy-in. Thus, clear, and efficient institutional arrangements are a vital element for effective ETIS utilization.

264. Information generated by ETIS is defined as the outcomes and outputs of ETIS data analysis, including:

- Summaries and aggregates in different forms;
- Trends and other analytical presentations;
- Relationships and factors which comprise underlying trade dynamics.

265. TRAFFIC negotiated an MOU, in conjunction with the CITES Secretariat, with the World Customs Organization, calling for an annual data exchange for seizures. The data from the World Customs Organization is a subset of the ETIS data; some seizures are made by the police and others are made by wildlife officials in the national parks.

266. TRAFFIC can isolate all seizures made by customs authorities on an annual basis and share it with the World Customs Organization (increasing WCO ivory seizures records by several hundred cases annually). WCA also isolates any seizures on ivory trade or elephant specimen trade and provides the data to ETIS (~30-50 cases annually that may not already be in ETIS).

267. All SC and CoP reports are reviewed and approved by the TAG before they are distributed to the Parties. Furthermore, each Party can request a more detailed report pertaining to all the information associated with their country. As highlighted earlier, before the reports are used and referenced for the CoP meetings, the Parties need to have reasonable lead time to review the results, and data pertaining to them, to address any concerns towards a resolution in advance of the CoP.

268. Resolution Conf. 11.17 (Rev. CoP18)[40] on National reports, urges all Parties to submit an annual illegal trade report to the Secretariat in accordance with the report format distributed by the Secretariat. At the same time, as outlined in Annex 1 to

[40] https://cites.org/sites/default/files/document/E-Res-11-17-R18.pdf

Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens, reporting on ivory seizures to ETIS is required, preferably in a standardized manner as outlined in Annex 1 to the Resolution. This has created a situation where, in one isolated instance, Turkey reported to the Secretariat some of the ivory seizures it made as part of its reporting on annual illegal trade, but it did not report these seizures to ETIS.

269. As noted by the Secretariat in Annex 1 to Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens, the requirement to report similar data sets for two streams of reporting may be considered an inconvenience for Parties, and it is likely that similar discrepancies will occur in the future unless this matter is addressed.

270. The only incident reported to date regarding the reconciliation gap in reporting is the identification of the incident involving Turkey. Furthermore, the concern regarding effort involved in providing similar seizure data sets for two distinct reports production is not considered a major issue by the Parties as communicated by the consultations with Parties for this review.

271. When the CITES Secretariat receives the annual illegal trade report, by 31st October each year, it is not reviewed thoroughly and scrutinized before data is passed to UNODC. For ETIS, it is required to report seizures within 90 days of their occurrence. The Secretariat sends a reminder to Parties, via notifications, for them to report in time for the inclusion of that data for the next report of ETIS to the Standing Committee/CoP. Unless the ETIS changes its requirement to submit seizure data to once a year, thereby coinciding with the expectation for annual illegal trade report, the possibility for discrepancy between the datasets is unavoidable as TRAFFIC needs to obtain the data in time to proceed with the ETIS-analysis and undertake the different consultations with individual Parties on this matter.

272. Either a manual reconciliation (done by a CITES Secretariat staff member), or an automated reconciliation (i.e., utilizing Excel Macro functionality), should be considered to address this concern. In parallel, the CITES Secretariat can issue guidance to ensure that the responsible Management Authority in each country enters and reconciles the entries for both reports. The Governance and Business Process Specialist has done a mapping and crossed checked the 'Minimum Required Information (MRI)' as reflected in Annex 1 of Resolution 10.10 (Rev. CoP18) on Trade in elephant specimens with data fields captured in the annual illegal trade report; all except three fields have been identified to be in common across the two domains represented by '*' in the following list:

- source of information
- date of seizure *
- agency responsible for seizure *
- type of transaction
- country of seizure *
- country of origin *
- country of export
- country of transit *
- country of destination/import *

- type of ivory and quantity *
- mode of transport *
- modus operandi *
- nationality of suspects *

4.6 Analytics Methodology

273. The analytical methods were developed to meet the requirements of CITES Resolution Conf 10.10 to describe levels and trends in the illegal ivory trade. Initially Bob Burn (RW Burn) reviewed the Bad Ivory Database System (BIDS) in 1997 to see if it was fit for the purpose to address the relevant parts of this Resolution. Based on this work, he developed ETIS and an initial methodology to describe trends in the illegal ivory trade attempting to address the key problems and biases with seizures data. However, there were no "off-the-shelf" methods for dealing with this kind of data. Furthermore, the lack of funding and timeliness of seizure data submission have hampered the in-depth statistical analysis and time required for each ETIS analysis cycle.

274. Since the start of ETIS in 1997, several adjustments to the methodology have been introduced based on new insight and feedback from Parties and stakeholders. Adjustments made are reflected in the associated ETIS CoP reports, and further explained and clarified upon request as reflected by the number of formal correspondence and official documents reviewed. The original design for the model was meant to discern trends in relation to policy but never set out to determine causality.

275. From an operational perspective since 2002, TRAFFIC, in collaboration with statisticians from the Statistical Services Centre of the University of Reading, has made a number of refinements to the database structure. The basic software programme has been enhanced, separating the seizures database files from the ETIS programme files in order to create an installable version of ETIS. In another development, a new version of ETIS was compiled using Excel on an MS Access-based platform, replacing Crystal Reports, the programme previously used for outputs of the seizures database. These modifications have served to address compatibility issues and reduce the number of software conflicts.[41]

276. In 2009 TRAFFIC, in concert with Fiona Underwood and Robert Burn, received a Darwin Initiative grant (USD 240,000.00) to develop a robust statistical methodology for analyzing the ETIS data, in addition to other updates and improvements to ETIS. The ETIS report based on the new statistical methodology was first presented at CoP16. Methods were documented separately in a peer reviewed paper (Underwood FM, Burn RW, Milliken T (2013) Dissecting the Illegal Ivory Trade: An Analysis of Ivory Seizures Data. PLoS ONE) and the following technical report (Burn Underwood Technical Report Modelling the illegal ivory trade).

[41] Milliken, T & Underwood, Fiona & Burn, R & Sangalakula, L. (2016). The Elephant Trade Information System (ETIS) and the Illicit Trade in Ivory: A report to the 17th meeting of the Conference of the Parties to CITES.

277. This update in methodology was developed so that the focus at the CITES meetings could be on the results, with trusted and peer-reviewed methods available for those that needed it.

278. When the model was being developed, many approaches including just using the data as is, data augmentation methods, and modelling transition probabilities approach were investigated. The Bayesian methodology was selected when the model was first developed as it was the only available approach that would allow to fit the complex model and was the most tractable given the data and computational methods that were available. Bayesian 'Hierarchical' was selected to address the structure of the data (observations within countries). Further development of the methodology has only been possible within the routine analysis and reporting cycle given no additional funding has been provided for enhancements and improvements.

279. Consideration for certain proxy variables in the analytics has been under scrutiny. Direct observation of the predictors had been next to impossible, so country-specific, time-based candidate proxy variables were sought instead, and those that provided the best fit to the data were identified. Using the best proxy variables, the model produced relative bias-adjusted and smoothed estimates of illegal ivory trade activity.

280. Since the first analysis in 2002 there have always been two components to the analysis:

- Trend Analysis: to describe trends in the illegal ivory trade over time using the Bayesian hierarchical latent variable model. The trends analysis produces bias-adjusted indicators of the trade: the 'Transaction Index' and 'Weight Index'.
- Cluster Analysis: to identify countries with similar characteristics with respect to the illegal ivory trade, addressed by carrying out a cluster analysis, although specifics have changed (once the trends analysis and bias-adjustment methods were developed, the variables used have been bias-adjusted). The cluster analysis was not developed for the NIAP process. Rather, CITES decided to use the results of the ETIS cluster analysis to inform the NIAP process at the Standing Committee preceding CoP16 in Bangkok, Thailand.

281. In a more technical context, the method used for cluster analysis is agglomerative clustering with Euclidean distance measure and Wards clustering. The cluster analysis looks at how similar each country is to every other country and is represented by the dendrogram. In addition, a Principle Component Analysis[42] is carried out to provide further information about relationships between countries and variables to aid TRAFFIC in their interpretation of results.

282. It has been noted that some Parties acknowledge that variables used in the cluster analysis to group countries together and then select those countries that are the most involved in the illegal ivory trade chain for potential inclusion into the NIAP-process,

[42] Principal Component Analysis, or PCA, is a dimensionality-reduction method that is often used to reduce the dimensionality of large data sets, by transforming a large set of variables into a smaller one that still contains most of the information in the large set.

are clearly explained and relevant for the analysis, while other Parties disagree with the select variables used.

283. A common perspective by the Parties is that the statistical methodology is complex, and it is not easy to completely understand all the finer elements of the model as they do not have the expertise. However, they are more concerned with the results of the analytics and interpretation, which is covered in more detail in the next section.

284. The trust in appropriateness and robustness of the methodology and the end-to-end analytics process varies. In most cases the perspective depends on how the Party is being implicated by the output. Countries such as China and Singapore have been and are quite concerned with certain aspects of the end-to-end analytics methodology. Their main concerns were first raised post CoP16 and formally communicated to CITES Secretariat.

285. It is noteworthy that within the limited resources available (post-Darwin grant) to ETIS, TRAFFIC has still been able to refine the methodology and address the LE Ratio bias-adjustment issues, including the development of the Trade Chain Index, and assess the integrity of the clusters with the sensitivity analysis. TRAFFIC recognizes that given the complex and heterogeneous nature of the data, there are inevitably various options for building a workable approach that addresses the questions being asked of the data, and other new approaches are worth exploring if resources and funding are available. Moreover, TRAFFIC has tried to refine and adjust the methods as necessary within existing constraints.

286. Responses to the review team's consultations (both written responses and virtual interviews) regarding the robustness of the analytics methodology have been varied across a continuum from not having a good understanding and generally unclear, to having a reasonable understanding and solid grasp per the following quote: "*bias adjustment done on the raw data of ivory seizures is clearly explained and represents a correct way to translate raw data into usable conclusions*". While the consultants have validated this view upon reviewing the evidential documents listed in Annex I, countries such as China and Singapore are not satisfied with the CITES, TAG and TRAFFIC collaborative comprehensive and succinct response. Annex J illustrates candidate proxy variables under scrutiny. This concern cannot be easily mitigated - and therefore likely to persist - unless the funds are secured to have independent research conducted to explore and evaluate alternative statistical modelling techniques and methodology. TRAFFIC has repeatedly supported such an initiative.

4.7 Analytics Interpretation

287. Qualitative analysis is as important as quantitative; however, qualitative is more subjective and requires extensive domain expertise. Clear consolidated interpretation of the analytical results of ETIS is of outmost importance and requires a comprehensive knowledge and understanding and overarching context of the ongoing illegal trade. ETIS provides an objective method to translate data related to ivory seizures into a clear identification of countries involved in the illegal ivory trade chain.

288. The ETIS Director provided the insight required based on his extensive knowledge, decades of experience, and a strong network that provided insight and information. These are not readily available to his replacement.

289. TRAFFIC contextualizes the ETIS analytical results back to the geography, key players and driving factors of the illegal ivory trade to provide a clear comprehensive narrative to reach the CITES Parties. Contextual viewpoints may need to be gathered from multiple subject matter experts, and then consolidated into one cohesive one.

290. The Market Survey Data supports validating the Cluster Analysis and assists with the narrative. For every CITES-ETIS analysis, the most recent published ivory survey reports are referenced in the bibliography. Dependency on a hands-on ivory market scan is problematic as a number of Parties are not clear on its significance for the analysis. Documentation and communications associated with the market survey are not reflective of the importance of the extensive elaboration and its value.

291. During the data collection phase, Data Providers have the opportunity to communicate different details pertaining to ivory seizures. One of these refers to the country of origin of the ivory (Question Number 6 “Country(ies) of origin” present in all ETIS forms). When DPs (Parties) declare that the ivory is coming from different countries, TRAFFIC assigns equal percentages to all countries involved. For example: If two countries are identified as countries of origin by a DP, then 50 % of ivory specimens seized will be assigned to each country. This happens in the absence of forensic examination. If instead a forensic analysis is done, more precise percentages are assigned to the countries of origin based on the forensic analysis reports. All the documentation reflecting the methodology need to clearly outline this assignment.

292. The determination of the categories A, B, C that informs the NIAP process depends both on the statistical calculations and expert knowledge, with catorgories B and C determinants mostly skewed towards the latter. Annex 3 of Conf. 10.10, (Rev. Cop18) on Trade in elephant specimens, states that no presumption will be made for Category B Parties (Parties markedly affected by illegal trade in ivory), and Category C Parties (Parties affected by illegal trade in ivory) are generally not recommended for participation in the NIAP process. Moreover, even though the determination of category C Parties is dependent on expert knowledge, it does not constitute a Party’s entry into the NIAP process; it just raises the awareness for the Party to take corrective/mitigating actions deemed appropriate. For further detail on the determination of the categories A, B, C, please refer to Section 6 of the statistical report appended in Annex M.

5. Ratings

293. The purpose of this section is to provide an overall gauge of the performance of the ETIS programme across a subset of standard UNEP evaluation criteria.

5.1 Assessment Framework

294. As a UNEP-administered Convention, the ETIS review was also underpinned by an evaluation framework based on the underlying questions in the ToR and others vetted by the CITES-MIKE Coordinator during the Inception and Fact-Finding stages. These were bundled under UNEP's evaluation criteria of strategic relevance, effectiveness, efficiency, sustainability and impact, which are a subset of the typical list that would normally be applied to UNEP projects, albeit tailored to align with the scope and context of the ETIS review.

295. In line with the UNEP Evaluation Policy and the UNEP Programme Evaluation Manual, the ETIS programme's performance was assessed in terms of strategic relevance, effectiveness, efficiency, sustainability and impact using the following definitions for each:

Strategic relevance: Responsiveness to the global development and environment agenda, as well as UNEP and broader UN policies, strategies and priorities.

Effectiveness: Likeliness of the realization of the programme goals and attainment of core objectives, including output quality and utility and progress on output delivery.

Efficiency: The timeliness of implementation, adherence to project budget, complementarity with ongoing processes, and actively minimizing redundancies.

Sustainability: Includes institutional and financial sustainability, and any signs of replication.

Impact: Factors and processes affecting project performance, appropriateness of programme design and management setup, stakeholder participation, project outreach, and quality of project monitoring.

296. Ratings for the ETIS review were assessed according to the following rubric[43]:

Highly Satisfactory (HS): The programme has no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency;

[43] Relevance and effectiveness are critical criteria and therefore, the overall rating of the project for achievement of objectives and results may not be higher than the lowest rating on either of these two criteria. Thus, to have an overall satisfactory rating for outcomes, a project must have at minimum satisfactory ratings on both relevance and effectiveness.

Satisfactory (S): The programme has minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency;

Moderately Satisfactory (MS): The programme has moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency;

Moderately Unsatisfactory (MU): The programme has significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency;

Unsatisfactory (U): The programme has major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency;

Highly Unsatisfactory (HU): The programme has severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

297. Sustainability[44] of the programme is rated in accordance to a four-point scale as follows:

Likely (L): There are no risks affecting the dimension of sustainability;

Moderately Likely (ML): There are moderate risks that affect the dimension of sustainability;

Moderately Unlikely (MU): There are significant risks that affect the dimension of sustainability;

Unlikely (U): There are severe risks that affect the dimension of sustainability.

5.2 Review Ratings

298. The principal objective of the ratings is to evaluate progress to date across standard metrics, and to provide critical recommendations which can help to ensure that the ETIS programme's performance is optimized and a prioritization made to close any identified gaps such that the objectives set out in Paragraph 27 (a) of Resolution 10.10 (Rev CoP18) on Trade in elephant specimens can be fully realized.

299. Table 11 below presents a summary of the ratings assigned by the Governance and Business Process Specialist, who is also an evaluation consultant. These ratings reflect the degree to which, in the judgement of the consultant, progress has been made that can ultimately support the achievement of the ETIS' core objectives.

300. It should be noted here that the ratings are a key element of the mechanism by which adaptive management can be achieved. They also provide a measure of

[44] In the context of the ETIS programme, sustainability is understood as the probability of continued long-term outcomes and impacts.

accountability and confidence to Parties. This is part of the feedback loop by which information is gathered that can guide decision-making.

301. All in all, the ETIS programme, notwithstanding challenges over the years, has been successful and has realized critical impacts that bode well for the conservation status of the African elephant (*Loxodonta africana*)[45]. The overall assessment is that ETIS' overall performance can be rated as "**Satisfactory"** based on the following assessed criteria.

Table 11: Summary of Ratings	
Criterion	***Overall Rating[46]***
F. Strategic Relevance	**Highly satisfactory**
G. Effectiveness	**Satisfactory**
H. Efficiency	**Satisfactory**
I. Sustainability	**Moderately Likely**
J. Impact	**Satisfactory**
Overall review rating	**Satisfactory**

5.2.1 Strategic Relevance

302. ETIS' objectives as set out in Paragraph 27(a) of Resolution 10.10. (Rev CoP18) on Trade in elephant specimens, and the manner in which it is implemented, are clearly consistent with and aligned to CITES' core mandate.

303. CITES' mandate is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. It works by subjecting international trade in specimens of more than 30,000 species of animals and plants to certain controls. Each Party to the Convention must designate one or more Management Authorities in charge of administering that licensing system and one or more Scientific Authorities to advise them on the effects of trade on the status of the species. The species covered by CITES are listed in three Appendices, according to the degree of protection they need.

304. ETIS is also aligned to General Assembly Resolution on Tackling illicit trafficking in wildlife A/73/L.120 (para 24):

> "*Also calls upon Member States to ensure that legal domestic markets for wildlife products are not used to mask the trade in illegal wildlife products, and*

[45] Prior to 25 March 2021, African elephants were treated as a single species, listed as Vulnerable. But the latest IUCN Red List is the first time the two species have been assessed separately, following the emergence of new genetic evidence. See: https://www.iucn.org/news/species/202103/african-elephant-species-now-endangered-and-critically-endangered-iucn-red-list

[46] The individual rating scale used for the criteria of Strategic Relevance, Effectiveness, Efficiency and Impact is consistent with UNEP guidelines as follows: Highly satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory and Highly Unsatisfactory. Similarly, the ratings used for the assessment of sustainability are also consistent with UNEP guidelines as follows: Highly Likely, Likely, Moderately Likely, Moderately Unlikely, Unlikely and Highly Unlikely.

> *in this regard urges parties to implement and systematically monitor nationally the implementation of the resolution adopted at the seventeenth meeting of the Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora recommending that all Governments close legal domestic ivory markets, as a matter of urgency, if these markets contribute to poaching or illegal trade.*"

305. The General Assembly resolution builds on a Resolution 1/3 passed at the first-ever United Nations Environment Assembly (UNEA) in June 2014, which strongly encouraged governments to commit to targeted actions to eradicate supply, transit and demand for illegal wildlife products - a key concern of UNEP's work with member states. The UNEA resolution promotes zero-tolerance policies and the development of sustainable and alternative livelihoods for communities adversely affected by the illegal trade.

306. From a conservation perspective, the ETIS programme is an important piece of the puzzle which, together with the MIKE programme, are important monitoring systems providing essential information on elephant populations, illegal killing of elephants and trade in their parts and derivatives across the trade chain to help inform decision making.

307. Recognizing that over 38,700 species – including roughly 5,950 species of animals and 32,800 species of plants[47] – are protected by CITES against over-exploitation through international trade, the Governance and Business Process Specialist finds it strange that ETIS (and its sister-programme, MIKE) which focuses on iconic flagship species that one most associates with illegal trade and listed as 'Vulnerable' on the IUCN Red List, in spite of its clear alignment with CITES' mandate and consistency with a number of resolutions from other UN bodies[48], is not supported by the core CITES Trust Fund and is dependent on voluntary contributions of Parties and the parallel fundraising efforts from TRAFFIC. Of course, the consultant appreciates Parties must balance priorities of countless species and look at the bigger picture. But, while WWF has its panda, the CITES logo embraces the imagery of the elephant to signal a connection to the illegal wildlife trade.

The Governance and Business Process Specialist's rating for strategic relevance is "Highly Satisfactory"

[47] These are listed in the three CITES Appendices at: https://cites.org/eng/app/index.php

[48] For example, the 73rd session United Nations General Assembly, the 193 Member States of the United Nations adopted its fourth resolution on tackling illicit trafficking in wildlife, singling out explicit concerns over the detrimental levels of rhinoceros poaching, the high levels of killings of elephants in Africa and the significant increase in illicit pangolin trafficking, as well as the illegal trade in other protected wildlife species.

5.2.2 Effectiveness

308. With approximately 30,000 records[49], ETIS has been an effective monitoring system to consolidate the knowledge base on the illegal ivory trade and supply chain. There was consensus and confidence among the 15 Parties consulted as part of the ETIS review that the manner in which the ETIS analysis is leveraged to inform decision making by CITES Parties (relating to, among others, the NIAP process), is robust, albeit that transparency can be improved through frequent communication and training. These parameters are largely the function of well-defined governance and processes, including regimented communication.

309. The effectiveness of the ETIS programme is assessed through the lens of CoP analytics reports and outputs, and the resulting decisions by Parties, and the actioning of these decisions by the Parties - based on recommendations made to the Standing Committee by the CITES Secretariat. From a process perspective, as the enabling system to provide the data and analytics required in support of the NIAP compliance mechanism, ETIS performs well based on the data available; however, it should be actively informed by interaction with other agencies such as UNODC.

310. The effectiveness of the ETIS programme is very much dependent on the robustness of its analytics framework. Whilst the analytical methods are robust and yield relatively accurate results, there is always an unsatisfied funding need for further exploratory analysis and testing of other statistical modelling techniques with a view towards enhancing and improving the analytical framework for ETIS.

311. When BIDS was reviewed in 1997 to see if it was fit for the purpose to address the relevant parts of this Resolution, it was done so with the intention to give visibility of the global ivory trade along the entire trade chain as a means to improve law enforcement capacity. It has since evolved and is now leveraged to support the NIAP compliance mechanism for which it was never intended. Therefore, ETIS' utility and usefulness for other areas of CITES' mandate has broadened.

312. When the methodology was conceived, there were no "off-the-shelf" methods for dealing with this kind of data to tackle the use case of monitoring the global illegal ivory trade. As such, it was custom built by the statisticians using the most appropriate and cost-effective technology available at the time to meet the minimum requirements in the Resolution. As per the development plan in Annex H, a detailed code review will be undertaken this year by TRAFFIC's new in-house analyst to include updated software packages, deleting redundancies and removing outdated versions of Java.

The Governance and Business Process Specialist's rating for effectiveness is "Satisfactory"

[49] Based on the report produced for the 73rd meeting of the Standing Committee in August 2020, as of 8 July 2020 there were 30,736 records in ETIS from 1989-2019, of which 27,961 represents ivory seizures, whilst the remainder comprised of non-ivory elephant products. This number excludes the records captured in 2020.

5.2.3 Efficiency

313. TRAFFIC has been providing commendable value through ETIS and supporting services on a modest budget. However, to ensure long-term viability of financial resources, the review recommends conducting a detailed legal and cost assessment of setting up different financial vehicles to accept private sector and philanthropic donations, a couple of which have been highlighted in this report, together with the recruitment of a consultant to develop a Sustainable Financing Framework. It would be prudent to review the existing ETIS development plan and to update it in advance so that a vision and roadmap for the next decade of operation is in place.

314. It has been noted that data collection from Parties can be carried out manually (i.e., via paper and pen). However, manual paper-based data collection can be fraught with issues around data quality and efficiency. TRAFFIC has recently released a revamped version of the ETIS Online on 15 October 2020 with enhanced user experience, functionality, and online edit and data validation protocols to improve the efficiency and effectiveness of data submission/collection and enhance data quality. There are options being considered to improve efficiency of manual processes associated with ETIS Online through automation which should improve efficiency going forward. Enabling protocol for a registration email scheduler has already been implemented, however, data reminder scheduler functionality is pending additional financial resources.

315. ETIS' governance and decision-making are effective and participatory but characteristic of MEAs are also grounded in consensus. The tradeoff to this model is time and reaching conclusions on difficult issues can be a drawn-out process spanning several meetings with different points of view among Parties. While accountability is well-defined, and responsibilities are followed through but not consistently, mostly due to lack of capacity, thereby diminishing the overall efficiency and responsiveness.

316. Technological solutions functionality and user interface evolve from their first implementation based on the user feedback and/or enhamcements planned by the information system development team. The changes are usually categorized as functional enhancments or refinement to the existing functionality. TRAFFIC has been responsive to both of these drivers for change to ETIS, based on resources and financing available.

317. As a benchmark of efficiency, the minimum funds required to maintain and support ETIS is reasonable and comparable to funding requirements for applications of a similar scope as noted in Table 10.

The Governance and Business Process Specialist's rating for efficiency is "Satisfactory"

5.2.4 Sustainability

318. Financial sustainability is the aspect of the ETIS programme that is most concerning and which does not inspire confidence. A major constraint for the financial sustainability is the scarcity of financial resources needed to meet minimum

requirements and, at the moment there is a budget shortfall of approximately USD 2800,000.00 for 2021-2023. As the ETIS programme does not draw from the core Trust Fund, the availability of financial resources to sustain and expand ETIS is uncertain beyond 2023 and parallel fundraising efforts by TRAFFIC, while laudable, have not secured the necessary resources on a scale that would enable continuity.

319. Parties have also not advanced the funding mechanism noted in Paragraph 7 of Annex 1 to Resolution 10.10 (Rev CoP18) on Trade in elephant specimens exposing ETIS to risk. As part of the ETIS review's findings and in an effort to close this gap, recommendations have been made on how to address both core administrative and operational costs, as well as costs associated with incremental improvements and enhancements of ETIS going forward. Consistent with Decision 18.21, per the original plan, the Secretariat would have had to develop a proposal for consideration by the Standing Committee at its 73rd meeting on possible approaches to address the financial and operational sustainability of the MIKE and ETIS programmes, based on the findings and recommendations emanating from this ETIS Review and consistent with Decision 18.19. However, based on the amended SC73 agenda due to it being held virtually, this topic will be postponed to SC74.

320. The main drivers of institutional sustainability are the formal governance structures supporting ETIS, including the Standing Committee, MIKE-ETIS Subgroup and TAG. Since these governance bodies are noted in Resolution 10.10, they will continue playing the supporting role going forward. Via interviews, the Governance and Business Process Specialist encountered evidence of strong champions and enablers of ETIS and these individuals will continue to have a positive influence on its trajectory going forward to build on the successes achieved thus far.

321. Deep understanding of illegal/legal wildlife trade is crucial. Moreover, an incredibly strong network and working relationships with many of the Parties have been instrumental in promoting open dialogue and enhanced cooperation; hence critical for the sustainability of the ETIS programme. The ETIS Director's departure will create a significant gap.

322. Data sparsity and complacency among Parties to report their data is also a concern for the sustainability of ETIS and the robustness of the reports going forward. As noted earlier, in 2020 TRAFFIC was unable to run the trend due to insufficient data. In January 2021, the CITES Secretariat sent out Notification No. 2021/011 reminding Parties to report every seizure of illegal elephant ivory and other elephant specimens made within their territories to the Elephant Trade Information System (ETIS). The Notification also requested Parties to submit any 2020 ETIS data by 31 March 2021, including those for 2018, 2019 and 2020, to ensure that data from such reports can be included in the upcoming analysis of ETIS data for 2020.

The Governance and Business Process Specialist's rating for sustainability is "Moderately Likely"

5.2.5 Impact

323. The following paragraph on page 22 from the latest Report on the Elephant Trade Information System to the Conference of the Parties (CoP18 Doc. 69.3) offers a window into the impact that the programme has had:

"This analysis presents the trend in illicit trade in ivory from 2008 through 2017 with illegal ivory trade activity tracked through Transaction and Weight Indices. The following conclusions can be made:
Over the last four years, our best estimate of global illicit ivory trade activity has shown annual incremental decline after peaking in 2012 and 2013, although broad confidence intervals characterize the results (Figure 4). Whilst the inclusion of additional seizure data for 2017 may alter this result somewhat in future analyses, illegal ivory trade activity appears to be exhibiting some measure of reduction, especially in the large raw ivory weight class. Under sustained pressure from the CITES-led NIAP process and major new policy interventions such as China's landmark closure of its domestic ivory market, there is little doubt that the illegal ivory trade is experiencing more global oversight and law enforcement pressure than previously was the case. The current period of flux and adaptation suggests that trade activity is beginning to drop but whether it will be sustained will need to be carefully watched. Further, it needs to be recognized that any decline in illegal ivory trade activity is also occurring in conjunction with an overall decline in elephant populations in Africa."

324. There have been some notable milestones, including China's decision taken on 31 December 2017 to ban elephant ivory trade within the country.

325. This is a different picture from 2011 which was the worst year for ivory seizures since an international ivory ban went into effect in 1989. In 2011, authorities seized more than 23 tons of ivory, which represented about 2,500 individual elephants killed.[50]

326. ETIS is also not a static system and both the underlying methodology and its supporting processes have been incrementally refined since inception, augmenting the data quality and validation processes, incorporating changes to how and which parameters are leveraged in the analytics, and learning from past analyses and the changing landscape of the illegal ivory trade. Most recently facilitating seizure data submission by the Parties has been enhanced through the launch of a new online user-friendly interface on 15 October 2020. These incremental measures have been purpose-built to improve ETIS, make it more robust and ensure that the data on which decisions are taken is able to make an impact on the ground.

The Governance and Business Process Specialist's rating for impact is "Satisfactory"

[50] Tom Milliken, Interview with Yale Environment 360 (January 2012).

6. Recommendations

327. The review has highlighted the ETIS programme's current state of governance, supporting processes, data management practices, analytics methodology, interpretation and sustainability, and underscored associated challenges therein while considering the Programme's mandate and objectives, based on best/right practice, and also taking into account the Programme's contextual realities and limitations. In this section, we discuss what ETIS programme will need to achieve in the target state to rise above the challenges, mitigate identified gaps and shortcomings.

6.1 Strengthening Institutional Arrangements

328. Currently there is no defined formal "ETIS team" within CITES; although there is an "Informal Support Network" of CITES resources that play a role at different junctures such as corresponding with TRAFFIC on day-to-day operational issues, overseeing TRAFFIC contractual obligations, and supporting CoP reporting during Plenary.

329. The ETIS review has laid bare that a few Parties are not clear as to whom or which team is the focal point for concerns related to the ETIS programme and during a number of consultations mixed up questions on ETIS with the MIKE programme. At minimum, it is recommended to establish a "CITES ETIS Coordinator" role as the lead CITES focal point to work closely with TRAFFIC and MIKIE-ETIS TAG to orchestrate content reviews (and approvals) between different governance structures and processes, to aid in data collection from the Parties, and to address Parties' procedural/data disputes. This role can be assigned to current staff member(s) and does not necessarily need a new headcount. If this function is not formalized within the CITES Secretariat, then CITES, through the Standing Committee and via the MIKE-ETIS Subgroup responsible for operational issues, must establish a clearly communicated focal point to ensure the right-level of governance and exude confidence that all concerns will be addressed in a timely manner.

330. The CITES ETIS Informal Support Network, and TRAFFIC-ETIS team have recently gone through organizational restructurings. When the dust has settled final roles, responsibilities, and interaction amongst CITES ETIS Informal Support Network, TRAFFIC-ETIS team members and CITES and TRAFFIC need to be clearly defined and communicated to all stakeholders. This should be through a formal channel such as a Notification and also posted on ETIS Online for reference.

331. The TAG has been instrumental in providing an invaluable level of oversight and contribution in an advisory capacity; this is evident in the role the TAG has played in shepherding progress towards closing many gaps and concerns raised by Parties both prior to and during the ETIS Review. The review recommends active involvement of the TAG in the refinement and validation of the analytics results, overall data management and reporting protocols, as well as the prioritization of the ETIS programme's enhancements and improvements. Expedited recruitment of a subject

matter expert in the global illegal ivory to join the TAG team is highly encouraged considering CoP19 is a year away.

332. **Timely seizure data reporting by the Parties is absolutely crucial** in order for TRAFFIC to produce quality science-based estimates of trends. The commitment to create a CITES-ETIS focal-point role to aid in data collection to assist TRAFFIC to outreach and communicate with the Parties on a more regular basis is of paramount importance.

6.2 Establish Data Governance Through Global Norms and Standards

333. The review recommends that the ETIS programme establishes a data management "rule book" that specifies the norms and conventions to govern and align ETIS' data, stipulating the parameters for data collection, processing, protection, storage, analysis and use. The Programme can extend Annex 1 of Resolution 10.10 CoP18 to be comprehensive, covering all data management concerns (Ref. Annex K for suggested refinements introduced for consideration).

334. Towards instilling stakeholder confidence, as a best practice, the Programme should revisit appropriateness of all data elements stored in ETIS database both from a privacy policy perspective and data ownership requirement.

6.3 Enhance Communication and Stakeholder Engagement

335. To elevate and prioritize the responsiveness to the Parties' disputes regarding the data associated with them and expediting a resolution, the review recommends for the CITES Secretariat to be given access to the ETIS data and to take on a more proactive role (regardless of whether it be through a CITES Informal Support Network or a more formalized "team") as the mediator to address data integrity issues with support from TRAFFIC.

336. Several Parties have raised concerns that they are not given time and opportunity in advance of the CoP to understand the report's results and narrative as it relates to them and to get clarification on their potential concerns. Advance distribution of the CoP report is highly recommended. Furthermore, a more proactive, targeted, frequent communication practice would be essential to reflect transparency.

337. Recognizing the sizable number of Parties and that their ETIS programme supporting members are replaced on occasion, the significance of frequently scheduled training sessions is paramount. The review has already recommended to TRAFFIC on holding frequently scheduled (perhaps quarterly), regimented, real-time training sessions that are recorded and subsequently posted online, covering ETIS Online functionality, data management, and the analytics framework. The agenda and topics to be covered should be tailored to feedback from the Parties and where the CITES Secretariat and TRAFFIC believe the focus subject area should be. The

Parties would sign-up for the session based on the training session's agenda and topics of interest, which should be distributed a couple of months in advance.

6.4 Ensuring the Quality of Data and Effective Use to Meet the Objectives

338. To promote data quality, TRAFFIC needs to define clear processes (system + workflow) for validation and confirmation of Parties' submitted seizure records. The review team has outlined a few process-flows for this context in section four that can be leveraged and expanded on.

339. One of the areas of contention for Parties is their implication in the trade chain by the country that submits the seizure record. The review team has recommended incorporation of ETIS Online notification functionality as a future enhancement enabling the data validation/confirmation workflow implemented by TRAFFIC. Further enhancement of the workflow to expedite resolution of these disputes is highly recommended.

340. Mobile enablement of ETIS Online to improve data quality through facilities like form-level validation rules while working offline, enabling Parties' law enforcement staff to record seizures in remote field locations should be considered by TRAFFIC as a mid to long term enhancement.

341. User access management has been very resource intensive, manual and inefficient. The review recommends for the CITES Secretariat to assign a focal point for the ETIS programme; a CITES ETIS Coordinator. Together with TRAFFIC, they should define and implement an effective and efficient user access provisioning process, which can introduce a system-enabled role-based access framework. The aim should be to gravitate towards a more automated workflow to approve and ascribe new users to agreed roles, subject to the availability of funding.

342. Dashboarding and visualization tools are commonly leveraged in enterprise to enhance user experience through presenting trends and charts dynamically/interactively. In the long-term, TRAFFIC may want to consider incorporation of an Open-Source visualization software such as 'Google Charts' or, 'Tableau Public' so that Parties can extract more value from ETIS Online through visualizing the aggregated, and country specific, data in various schemes.

343. The overlapping data reporting requirement relating to elephant specimens to both ETIS and the CITES Secretariat as part of the annual illegal wildlife trade report and its lack of reconciliation is of concern. To resolve this, CITES should consider looking into the provisioning of a reconciliation process between the ETIS data submission form and the illegal wildlife trade report submission form. Either a manual (by a CITES Secretariat staff member), or automated reconciliation (i.e., utilizing Excel Macro functionality) should be considered to minimize the risk of repeat incidents. In parallel, the CITES Secretariat can issue guidance to ensure that the responsible Management Authority in each country enters and reconciles the entries for both reports.

6.5 Strengthening the ETIS Programme's Financial Framework and Sustainability

344. Considering the limited funding and competing priorities, CITES Secretariat should look to leverage synergies with other UN and global agencies from a resource and knowledge/expertise perspective. The review recommends establishment of a forum through which CITES ETIS and MIKE teams, and ICCWC members would discuss and outline a collaborative and agreed upon mechanism on how to support the survival of African and Asian elephants, and curtail the illegal trade of ivory and other elephant specimen, as well as to discuss opportunities for data-sharing, with the parameters of a data sharing policy, to supplement financial resources to sustain the ETIS programme.

345. TRAFFIC has been providing commendable value through ETIS and supporting services on a modest budget. However, to ensure long-term viability of financial resources, the review recommends conducting a feasibility assessment to evaluate effectiveness/efficiency of alternative supporting mechanisms a couple of which have been highlighted in the report. It would be prudent to review the existing ETIS development plan and to update it in advance so that a vision and roadmap for the next decade of operation is in place.

346. 'Crowdsourcing' is a sourcing model in which individuals or organizations obtain good and service, including ideas, micro-tasks and finances, from a large, relatively open and often rapidly evolving group of participants. Currently, crowdsourcing typically involves using the internet to attract and divide work such as research projects between participants to achieve a cumulative result. The review recommends exploring the 'crowdsourcing' option for research into assessment of alternative statistical modelling. It should be noted that all, or a subset of the ETIS data needs to be made available for any research initiative on statistical methodology.

6.6 Refining and Streamlining the Analytics Code-base and Supporting Documentation

347. Streamline the 'R' scripts (+38) to enhance execution performance and minimize hands-on intervention. Additionally, utilize the latest version of 'R' functional libraries to make the code more efficient and clearer to understand.

348. The analytics 'R' code-base has been made available online for download. To minimize a Party's effort in setting up the computer environment to run the code, publish the 'R' software and hardware specifications online that have been validated.

349. Rationalize the supporting documentation for ETIS (i.e., Standard Operating Procedures) and make as much of it, as required and reasonable, available to all stakeholders on GitHub and/or ETIS Online. Moreover, clearly sequence the 'R' procedures for completing each unit of analysis and all associated assumptions.

6.7 Conducting Comprehensive Exploratory and Explanatory Analysis

350. The analytics is enhanced by expanding the depth and breadth of the datasets used. While already on the TAG's radar and ongoing agenda, ETIS ought to bring to a successful conclusion, subject to the availability of funding:

a. Exploration of qualitative input towards quantitative data, and more attention given to the current state consideration of overall illegal trade patterns/trend in the overall analysis using the datasets held by the IUCN/SSC African Elephant Specialist Group's African Elephant Database (elephant numbers), MIKE (illegal killing) and ETIS (illegal trade) in a single model;

b. Inclusion of price data on the value of ivory, which has not been used in the ETIS analysis to date. A robust database on ivory prices globally now exists following a project with the World Bank. These data (20,500+ data points covering the years 1970 to 2015) need to be augmented for recent years and could be examined to help better understand the economics of the illegal trade in ivory. Using the database structure, TRAFFIC's dataset for the ongoing tracking of ivory prices should be considered for integration into a core ETIS activity;

c. Incorporation of stockpile information. The relationship between ivory stockpiles and illegal ivory trade needs further examination. Apart from the illegal killing of elephants tracked by the MIKE programme, ivory stockpiles around the world constitute another source of elephant ivory;

d. Whilst a clear explanation and communication of the source grades (A, B, C) to all stakeholders and parties is critical, modelling exploration of the impact of removing lower source grades (B and C) data from trend analyses should be considered (already a planned future activity by TRAFFIC, which needs to go through the suggested governance process with TAG oversight before commencement).

351. Whilst analytical methods are robust and yield relatively accurate results, to address the concerns raised by a few Parties, the review highly recommends to secure the funds through the Parties that have an ongoing concerns, for an independent research initiative to analyse and investigate alternative statistical models and techniques with the view towards enhancing and improving the analytical framework for ETIS, and hence, projecting confidence by all Parties on the robustness of the analytics framework.

352. The use of covariates in the analysis has been of major concern to the Parties. Even though the concerns have been responded to with clear explanation, the Programme would benefit from greater identification and testing of other covariates that could feature as independent country-specific variables for bias adjustment purposes, or as explanatory factors to interpret and understand ETIS results more

effectively. This has already been recognized by TRAFFIC and is a planned activity but will need the TAG's support and concurrence.

353. Many drivers of the illegal killing of elephants and illegal trade in ivory have been identified, for example poverty, corruption, economic development, infrastructure accessibility, economic value, poor law enforcement, etc., but never has a study been done to consider the full range of probable drivers and understand the relative interplay between them. This review recommends the ETIS in collaboration with MIKE, to conduct a thorough examination of the key drivers and their causal relationships in terms of elephant poaching and illegal ivory.

7. Conclusions

354. As reflected in the ratings (Section Five), TRAFFIC's operations have been diligent and responsive to the requirements in Resolution 10.10 (Rev CoP18) on Trade in elephant specimens, as well as proactive in addressing Parties' concerns, but funding constraints have been an impediment and have adversely impacted rapid enhancements and improvements. Key considerations:

- The long-term servicing of the ETIS Online facility and the core supporting activities for the CITES Parties needs to be adequately supported so that it serves its purpose in a timely and robust manner.

- The proposed ETIS development plan in Annex H needs to be reviewed to evaluate what is required for the sustainability of the Programme, and augmented as required based on the recommendations outlined in this report. TRAFFIC, in consultation and concurrence with both the TAG and MIKE-ETIS Subgroup, will need to produce a 3-5 year roadmap for major activities to be undertaken in order to provide a clear vision of the ETIS Programme's evolutionary path and future trajectory, and to determine the funding envelope required to be secured through proactive campaigning and resource mobilization efforts via both traditional and non-traditional donors.

355. Accountabilities and responsibilities for various stakeholder groups are well-defined, but resource capacity and funding constraints hinder advancing the ETIS programme to its full potential. Key considerations:

- The recent reorganizations of TRAFFIC and the CITES Secretariat offer an opportunity for a more efficient and effective alignment of resources, which needs to be explored diligently. Moreover, considering the limited funding and competing priorities, the CITES Secretariat should look to leverage synergies within its organization and other UN and global agencies where appropriate and feasible.

- Funding has been provisioned by various stakeholders to-date, from country specific direct contributions to the CITES Conservation Trust Fund or indirectly through the MIKE Programme, and by TRAFFIC directly engaging entities that have an interest in the preservation of wildlife and specifically elephants. Funding certainty to support ETIS' day-to-day operations provides the stability required to promote additional contributions and time investment by the supporting team. The value proposition for global elephant population conservation needs to be the '**basis'** for supporting operational and management process and programmes such as MIKE and ETIS.

356. ETIS was not built to support compliance processes such as National Ivory Action Plans Process; however, it is the only instrument available that can provide the required analytics output to inform the process. Key considerations:

- The cluster analysis is the foundation and underlying piece of the ETIS report that assists in identifying Parties to participate in the NIAP process. Since tacit domain knowledge is essential to interpret the output from the cluster analysis, there is an inherent perceived subjectivity that is unavoidable. The output

interpretation has been performed with competency and a full sense of responsibility. To ensure expert and skilled execution of cluster analysis going forward, new acquired expertise and knowledge (Dr. Sharon Baruch-Mordo) will be complemented in the short-term by the interim consultative engagement of the former ETIS Director, which not only will ensure continuity, but also facilitate knowledge transfer for long-term viability.

- The TAG plays an instrumental role by offering a wide range of knowledge and expertise in the illegal wildlife trade and advanced analytics as an independent advisory committee. Moreover, the TAG's insight and input in the ETIS analysis to the CoP is critical in instilling confidence in the results. This review team believes the TAG's contribution and role needs to be expanded as highlighted throughout this report through a revision of the associated ToRs and provisioning of financial support for member participation in the annual meetings and conferences, where feasible.

357. The knowledge management discipline is a foundational pillar for any organization / program, enabling it to operate and perform effectively and efficiently. Strengthening institutional arrangements for sharing information, knowledge management (through the definition of people, processes and technology enablers), and training is paramount in ensuring the efficient management of ETIS. Supporting documentation and formal training on how to use ETIS the way it was meant to be used will minimize any doubts, misunderstandings, unnecessary errors, and problems. Key considerations:
    - Explicit and implicit knowledge can be easily documented and articulated, so it can be shared and applied. By having a comprehensive, succinct and current set of supporting documents, TRAFFIC can ensure information and knowledge is retained and transferred easily in the event of staff turnover or new staff assignments. Furthermore, supporting Standard Operating Procedures (SOPs), methodologies, training presentations and artifacts should be customized/right-sized for the audience in mind (i.e., ETIS SOP for consumption by TRAFFIC's ETIS support staff vs. ETIS SOP for Parties' reference). As most enabling services, enhanced documentation practice suffers from funding constraints.

    - Online education, self-directed e-learning modules, training, and seminars have gone mainstream, especially in the context of the COVID-19 global pandemic. This also offers an additional benefit of reducing travel, conference, training, translation and entitlement expenses which can add up and be prohibitively expensive for global MEAs. To this end, training activities should target primarily Data Providers of the ETIS and select CITES ETIS supporting team members. Additional investment in capacity building would also help traceability to achieving objective (iv) in Paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens. 'ETIS in a nutshell' presented in Annex B is a very good ETIS primer for any and all stakeholders.

358. Timely engagement is critical throughout the ETIS Data Management Lifecycle.

Effective engagement is a natural extension of a robust governance framework and is a critical factor for successful end-to-end operations; it ensures that ETIS is aligned to, and supports, the ETIS programme's strategies and mandate. Key considerations:

- Targeted, timely, frequent, proactive as well as reactive communication of new and upcoming changes and development(s) through structured release and change management processes are paramount.

- Reasonable time to engage with Parties should be provisioned in the end-to-end reporting cycle to allow results to be internalized, validated and contested, if needed, without compromising the time needed to conduct the annual analysis and produce quality reports.

359. It is imperative there is a process to justify any change to a record at any given point in time and that this change should be done with equal disclosure and consent by the Party in question. Key considerations:

- Because a primary ETIS consideration is the trade route associated with each seizure case, countries which rarely or never report seizures themselves can become highly implicated in illegal trade based on data of the trade routes of illegal transactions provided by other nations; hence, identification and credibility of the trade chain should be scrutinized and requires concerted attention.

- Functionality in the recently launched ETIS Online will go a long way to close perceived gaps on the change management of seizure records, but it needs to be supported by a workflow and be actively brokered to be outlined and formalized in an SoP. In more contentious circumstances where a Party is implicated by another and there is disagreement over the legitimacy of a seizure record, TRAFFIC should work closely with the recommended CITES-ETIS focal point and the Chair of the MIKE-ETIS Subgroup brokering the conversation to a conclusion.

360. The analytics framework's main fuel is data. Receiving good data is extremely important in securing good results from the system such as an accurate, timely, and relative reflection of the illegal trade in elephant ivory in terms of understanding the global scale of illegal trade, key players, the most important pathways of movement and other relevant dynamics. Key considerations:

- Effort by CITES Parties in meeting submission timeliness, completeness and accuracy of reported seizure data is well worthwhile and will make the results more robust and enables the allocation of scarce resources to more value-added activities such as system enhancements and statistical methodology enrichment/refinement.
- The information quality is likely to be more robust if it comes directly from the Parties or other official reliable sources that apply sound methodologies and processes to address data integrity. As best practice, quality assurance processes should also consider the use of different sources of information where relevant and available, but with caution. TRAFFIC does make a reasonable effort to validate the data it receives from official government

agencies.

361. The analytical methods are robust and yield relatively accurate results. There is always an unsatisfied funding need for further exploratory analysis and testing of other statistical modelling techniques with a view towards enhancing and improving the analytical framework for ETIS. Key considerations:

- The use of covariates in the analysis has been of major concern to the Parties. Even though the concerns have been responded to with clear explanations, the Programme would benefit from greater identification and testing of other covariates that could feature as independent country-specific variables for bias adjustment purposes, or as explanatory factors to interpret and understand ETIS results more effectively. This has already been recognized by TRAFFIC and is already slated as a planned activity but will require the TAG's support, concurrence, and supporting funds.
- Many drivers of the illegal killing of elephants and illegal trade in ivory have been identified, for example poverty, corruption, economic development, infrastructure accessibility, economic value, poor law enforcement, etc., but never has a study been done to consider the full range of probable drivers and understand the relative interplay between them all. Exploring drivers and their causal relationships in terms of elephant poaching and illegal ivory, and the significance of other data points/sets towards enhancing ETIS would be a valuable undertaking.

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Annex A: Terms of Reference

Job Opening number(s):	20-United Nations Environment Programme-134329-Consultant 20-United Nations Environment Programme-134330-Consultant
Job Title(s):	Governance and Business Process Specialist Data Management and Statistical Analysis Specialist
General Expertise:	Management and Analysis
Category:	Programme Management
Department/ Office:	United Nations Environment Programme
Organizational Unit:	UNEP ODED CITES

Duties and Responsibilities

The United Nations Environment Programme (UN Environment) is the leading global environmental authority that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and serves as an authoritative advocate for the global environment. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between States. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival (www.cites.org). The CITES Secretariat is administered by UN Environment and is located in Geneva duty station.

The Elephant Trade Information System (ETIS) was established through the adoption by the Parties of Resolution Conf. 10.10 on Trade in elephant specimens at the 10th meeting of the Conference of the Parties (CoP10, 1997, Harare). Among others, Resolution Conf. 10.10 called for the establishment, under the supervision and direction of the Standing Committee, of a comprehensive international system to monitor the illegal trade in elephant specimens. Initially, an existing database of ivory seizure information, TRAFFIC's Bad Ivory Database System (BIDS), was designated as the appropriate instrument for these purposes.

To serve the needs of the CITES Parties more effectively, and through a consultative process involving a number of technical experts worldwide, BIDS eventually evolved into ETIS, a far more sophisticated monitoring tool. ETIS is a comprehensive information system to track illegal trade in ivory and other elephant specimens. Its objectives are to record and analyse levels and trends in illegal trade, assess whether and to what extent observed trends are related to measures concerning elephants and trade in elephant specimens taken under the auspices of CITES; establish an information base to support the making of decisions on appropriate management, protection and enforcement needs; and build capacity in elephant range States and, as applicable, countries involved in trade in elephant specimens. The central component of ETIS is a database on records of seizures of elephant specimens (mainly ivory) that have occurred anywhere in the world since 1989. The seizure database is supported by a series of subsidiary databases that score law enforcement effort and efficiency, rates of reporting, and domestic ivory markets.

Since its inception, ETIS has been managed by TRAFFIC on behalf of the CITES Parties. This work has been led by the TRAFFIC office in Harare, Zimbabwe. The Secretariat is mandated to report on information and analysis provided by ETIS at each meeting of the

Conference of the Parties and, subject to the availability of adequate new ETIS data, at relevant meetings of the Standing Committee. TRAFFIC therefore produces a comprehensive analytical report of the ETIS data assessing the factors addressed in the above objectives prior to each meeting of the Conference of the Parties. To ensure that there are sufficient data from which to assess illegal trade, the provisions of Annex 1 to Resolution Conf. 10.10 (Rev. CoP18) as agreed by the Conference of the Parties to CITES states that all Parties should communicate information on elephant ivory and other elephant product seizures to the CITES Secretariat or directly to TRAFFIC within 90 days of their occurrence. While Parties often do not strictly apply this timeframe, it is worth noting that the seizure database has nonetheless grown from around 4,000 records in 1997 to nearly 30,000 records in January 2020.

The CITES Standing Committee provides policy guidance to the Secretariat concerning the implementation of the Convention and among others it coordinates and oversees, where required, the work of other committees and working group and carries out tasks given to it by the Conference of the Parties. At its 70th meeting in October 2018 (Russian Federation) the Standing Committee adopted Terms of Reference for the review of the ETIS programme. At the 18th meeting of the Conference of Parties (CoP) to CITES, the CoP adopted Decision 18.18 on the review of the ETIS programme that directs the CITES Secretariat to include in the terms of reference for the review of the Elephant Trade Information System (ETIS) programme the issue of overlapping reporting requirements created under Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens and Resolution Conf. 11.17 (Rev. CoP18) on National reports and the challenges posed by the different data-sharing policies, and work closely with the consultants carrying out the review to identify possible solutions.

Two consultants will be appointed to assist with the review, i.e. Governance and Business Process Specialist and a Statistician. The two consultants will collaborate and prepare a consolidated report that covers the governance, process and statistical matters to be addressed in the review.

These terms of reference cover the part of the review to be done by the Governance and Business Process specialist and Data Management and Statistical Analysis Specialist

Duties and Responsibilities for the Governance and Business Process Specialist:

The Governance and Business Process Specialist, in collaboration with the Statistician to be appointed, will be responsible to conduct a review of the ETIS programme to ensure that (a) ETIS is operating in an appropriate, transparent and accountable manner; (b) CITES Parties are engaged as appropriate; and
(c) ETIS produces scientifically robust analyses to be used in CITES decision making processes in accordance with the provisions in Resolution Conf. 10.10 (Rev. CoP18). Based on the review findings, recommendations should be formulated to (i) further strengthen the methodology used throughout the ETIS process (if required); (ii) address the institutional arrangements and resources needed to implement any proposed recommendations to amend the ETIS methodology or Resolution Conf. 10.10 (Rev. CoP18) and (iii) deal with the institutional arrangements and resources needed to adequately meet the objectives of ETIS and ensure its longer-term sustainability.

The following tasks must be completed:

A) Review the provisions in Annex 1 (Monitoring illegal trade in ivory and other elephant specimens) of Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens, with special reference to sections 2 (Scope), 3 (Methods), 4 (Data collection and compilation) and 5 (Information, data analysis and interpretation), to determine

i) whether these provisions and their implementation are adequate to meet the objectives of ETIS, as set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18), and are sufficiently robust, transparent and scientifically justifiable.
ii) whether the following processes used by TRAFFIC are adequately described in Annex 1 to Resolution Conf. 10.10 (Rev. CoP18), and sufficiently contribute to achieving the objectives of ETIS:
• data collection
• data validation with Parties
• data dissemination
• reporting the results of the analysis to Parties and the CITES Secretariat.
iii) whether there is a need to amend Annex 1 in Resolution Conf. 10.10 (Rev. CoP18) and if so, propose amendments as required.
iv) whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan process as outlined in Annex 3 to Resolution Conf. 10.10 (Rev. CoP18)].

B) Review the current institutional arrangements and resources available to meet the objectives of ETIS as set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18) and with special reference to Annex 1, section 7, and make recommendations to:
i) implement any proposed recommendations to amend the current ETIS methodology or Resolution Conf. 10.10 (Rev. CoP18);
ii) address possible challenges and the programmes' longer-term sustainability.

C) Assess the reporting requirements created under Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens and Resolution Conf. 11.17 (Rev. CoP18) on National reports, and make recommendations to address:
i) the issue of overlapping reporting requirements; and
ii) the challenges posed by the different data-sharing policies

In undertaking the review indicated above, due consideration should be given to among others:
a) the context within which ETIS was developed and how the ETIS analysis is currently used in CITES processes and decision making;
b) the institutional arrangements, operations and ability to meet the objectives of ETIS set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18);
c) the issues raised by Parties in relation to the ETIS methodology and analysis (to be provided by the CITES Secretariat);
d) the submissions received from Parties concerning the ETIS methodology, in accordance with paragraph 158 v) of document SC69 Doc. 29.3 and submissions received by the Secretariat on or before 28 February 2019 (to be provided by the CITES Secretariat);
e) ETIS reports submitted for consideration by the Conference of Parties, including documents CoP17 Doc. 57.6 (Rev. 1) and CoP16 Doc. 53.2.2 (Rev. 1);

f) information provided by the MIKE-ETIS Technical Advisory Group relating to the ETIS analysis (including Information documents CoP17 Inf. 67 and SC69 Inf. 22);
g) Peer-reviewed scientific publications relating to the ETIS analyses, including: Underwood, F.M., Burn, R.W., Milliken, T. (2013). Dissecting the illegal ivory trade: an analysis of ivory seizures data. PLoS One 8(10): e76539; and Burn, R.W., Underwood, F.M. (2012). A new statistical modelling framework to interpret ivory seizures data: A technical report describing the new modelling framework for analysing seizures data from the Elephant Trade Information System. Mathematics Report series (1/2013), Department of Mathematics and Statistics, University of Reading, UK;

h) the existing databases and standard operating procedures used in the ETIS analysis; and
i) other relevant scientific literature and studies on the statistical analysis of:
a. data relating to illegal trade in elephant specimens; and
b. illegal wildlife trade data; and
c. other illicit trade data.

The Governance and Business Processes Specialist and Statistician (the consultants) will work with a nominated focal point from the CITES Secretariat (CITES MIKE Coordinator) and oversight will be provided by the MIKE and ETIS Subgroup of the CITES Standing Committee. In addition, the consultants will consult with Parties, TRAFFIC, the statisticians involved in the development of the statistical analysis for ETIS and responsible for the ETIS analysis, the MIKE and ETIS Technical Advisory Group members, and other stakeholders, as appropriate. The CITES MIKE Coordinator will provide assistance to the consultants to facilitate the consultation process. The consultation process should include sharing the progress report, preliminary findings and the final report with Parties, TRAFFIC and the statisticians involved in the development of the statistical analysis for ETIS and responsible for the ETIS analysis.

Duties and Responsibilities for the Data Management and Statistical Analysis Specialist:

The Statistician, in collaboration with the Governance and Business Process Specialist to be appointed, will be responsible to conduct a review of the ETIS programme to ensure that ETIS produces scientifically robust analyses to be used in CITES decision making processes in accordance with the provisions in Resolution Conf. 10.10 (Rev. CoP18). Based on the review findings, recommendations should be formulated to address any problems identified to and to further strengthen the methodology used in the ETIS process and analysis.

The following tasks must be completed:

A) Review the provisions in Annex 1 (Monitoring illegal trade in ivory and other elephant specimens) of Resolution Conf. 10.10 (Rev. CoP17) on Trade in elephant specimens, with special reference to sections 2 (Scope), 3 (Methods), 4 (Data collection and compilation) and 5 (Information, data analysis and interpretation), to determine
i) whether the following processes used by TRAFFIC are adequately described in Annex 1 to Resolution Conf. 10.10 (Rev. CoP17), and sufficiently contribute to achieving the objectives of ETIS:

• data collection
• data validation
• data management
• data analysis (including the code / algorithm used for the analysis)
• data interpretation
• review of analysis
• technical outputs and reports.
ii) whether there is a need to amend Annex 1 in Resolution Conf. 10.10 (Rev. CoP18) and if so, propose amendments as required.
iii) whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan process as outlined in Annex 3 to Resolution Conf. 10.10 (Rev. CoP18)].

B) Prepare a report outlining the findings of the review and recommendations relating to possible changes to the Resolution and ETIS processes and analysis.

In undertaking the review indicated above, due consideration should be given to, among others:
i) the issues raised by Parties in relation to the ETIS methodology and analysis (to be provided by the CITES Secretariat);
ii) the submissions received from Parties concerning the ETIS methodology, in accordance with paragraph 158 v) of document SC69 Doc. 29.3 and submissions received by the Secretariat on or before 28 February 2019 (to be provided by the CITES Secretariat);
iii) ETIS reports submitted for consideration by the Conference of Parties, including documents CoP17 Doc. 57.6 (Rev. 1) and CoP16 Doc. 53.2.2 (Rev. 1);
iv) information provided by the MIKE-ETIS Technical Advisory Group relating to the ETIS analysis (including Information documents CoP17 Inf. 67 and SC69 Inf. 22);
v) SC70 Com. 15 – p. 2 g) Peer-reviewed scientific publications relating to the ETIS analyses, including: Underwood, F.M., Burn, R.W., Milliken, T. (2013). Dissecting the illegal ivory trade: an analysis of ivory seizures data. PLoS One 8(10): e76539; and Burn, R.W., Underwood, F.M. (2012). A new statistical modelling framework to interpret ivory seizures data: A technical report describing the new modelling framework for analysing seizures data from the Elephant Trade Information System. Mathematics Report series (1/2013), Department of Mathematics and Statistics, University of Reading, UK;
vi) the existing databases and standard operating procedures used in the ETIS analysis; and
vii) other relevant scientific literature and studies on the statistical analysis of:
a. data relating to illegal trade in elephant specimens;
b. illegal wildlife trade data; and
c. other illicit trade data.

The Statistician and the Governance and Business Processes Specialist and Statistician (the consultants) will work with a nominated focal point from the CITES Secretariat (CITES MIKE Coordinator) and oversight will be provided by the MIKE and ETIS Subgroup of the CITES Standing Committee. In addition, the consultants will consult with Parties, TRAFFIC, the statisticians involved in the development of the statistical analysis for ETIS and responsible for the ETIS analysis, the MIKE and ETIS Technical Advisory Group members, and other stakeholders, as appropriate. The CITES MIKE Coordinator will

provide assistance to the consultants to facilitate the consultation process. The consultation process should include sharing the progress report, preliminary findings and the final report with Parties, TRAFFIC and the statisticians involved in the development of the statistical analysis for ETIS and responsible for the ETIS analysis.

Ultimate Result of Service:

Governance and Business process Specialist: A detailed report on the review of the governance and business processes of the ETIS programme as well as recommendations to ensure the objectives of the programme as set out in CITES Resolution Conf. 10.10 (Rev. CoP18) can be met over the long term.

Data Management and Statistical Analysis Specialist General: A report on the review of the ETIS programme data management and statistical analysis methodologies, including recommendations to further strengthen the methodology used in the ETIS process and analysis

Title & ID Number of Programme / Project:

Governance and Business Processes specialist; MIKE-ETIS Support: ETIS programme review; SB- 014428
Statistician; MIKE-ETIS Support: ETIS programme review; SB-005458.16.02.03

Is any other department or office of the Secretariat or any other organization of the United Nations involved in similar work to the best of your knowledge? **No**

Travel Details:

Applicable
Travel associated with the consultancy includes (virtual means to conduct consultation to be used, where feasible):

- consultation with relevant TRAFFIC staff (including the former ETIS Director - through electronic means);
- presentation of the preliminary / final report to the CITES Secretariat (Geneva); and
- attend the CITES Standing Committee.

Travel costs will be covered by the CITES Secretariat.

Outputs / Work Assignment:

Deliverables for the Governance and Business process Specialist:
A preliminary and final report prepared by the Governance and Business Process Specialist, in collaboration with the Statistician, that includes specific sections on the following:

a) An executive summary that highlights the main findings and key recommendations (not longer than 12 pages).

b) The key outcomes of the review of the ETIS programme relating to:
i) the technical and operational aspects of the analytical framework of the ETIS programme;
ii) the institutional arrangements for ETIS, including operations and resources;
iii) the provisions contained in Annex 1 of Resolution Conf. 10.10 (Rev. CoP18), with specific reference to sections 2 to 5 and whether these provisions and their implementation are adequate to meet the objectives of ETIS, set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18);
iv) the overlapping reporting requirements under Res. Conf. 10.10 (Rev. CoP18) and Res. Conf. 11.17 (Rev. CoP18) and challenges posed by the different data-sharing policies; and
v) any other matter identified in the review process that could strengthen the ETIS program.

c) Recommendations, based on the findings of the review of the ETIS programme, including recommendations relating to:
i) the need to amend Annex 1 in Resolution Conf. 10.10 (Rev. CoP18) and if so, propose amendments as required
ii) whether the ETIS analysis is able and suitable to support CITES processes and decision making such as the National Ivory Action Plan process
iii) the means to address overlapping reporting requirements under Res. Conf. 10.10 (Rev. CoP18) and Res. Conf. 11.17 (Rev. CoP18) and challenges associated with the different data-sharing policies
iv) institutional arrangements and resources required to implement any proposed recommendations to amend the current ETIS methodology or Resolution Conf. 10.10 (Rev. CoP18)
v) institutional arrangements and resources required to adequately meet the objectives of ETIS and ensure its longer-term sustainability.

Deliverables for the Data Management and Statistical Analysis Specialist:

A preliminary and final report prepared by the Statistician to be incorporated in the report prepared by the Governance and Business Process Specialist, that includes specific sections on the following:

a) An executive summary that highlights the main findings and key recommendations (not longer than 6 pages).

b) The key outcomes of the review of the ETIS programme relating to:
i) the technical aspects of the analytical framework of the ETIS programme, with specific reference to the aspects referred to in paragraph A i);
ii) the provisions contained in Annex 1 of Resolution Conf. 10.10 (Rev. CoP17), with specific reference to sections 2 to 5; and whether these provisions and their implementation are adequate to meet the objectives of ETIS, set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP17); and
iii) any other matter identified in the review process that could strengthen the ETIS program.

c) Recommendations to address any problems identified to and to further strengthen the methodology used in the ETIS process and analysis.
All documents are to be delivered in English and by electronic means.

Expected Duration:

The assignment is expected to last 6 months.

Evaluation Criteria:

Evaluation Criteria for the Governance and Business process Specialist:

Competency:
i) Knowledge and understanding of institutional governance, especially managing sensitive and controversial processes, and balancing the interests of a diversity of stakeholders
ii) Expertise in process analysis and auditing, especially to improve efficiency and transparency, and to verify if procedures, practices and controls are adequate to deliver on stated objectives.
iii) Knowledge of CITES, in particular its decisions, policies and discussions relating to elephant conservation, trade in elephant specimens, elephant poaching and illegal trade in ivory [Resolution Conf. 10.10 (Rev. CoP18)], is desirable.

Skills:
Skills in networking and communications, and experience in structuring meaningful engagement with multiple parties, scientists, specialists and stakeholders.

Academic Qualifications:
University degree (or equivalent) in business administration, governance and policy, wildlife management, conservation or a related subject

Experience:
i) Experience in programme and project evaluation and review, with a strong focus on institutional strengthening, change and restructuring.
ii) Experience in international engagements and decision-making processes, especially those associated with multilateral environmental agreements
iii) Experience in review of governance structures and processes.

Language:
English, French and Spanish are the working languages of CITES. Fluency in English is required. Knowledge of French or Spanish is desirable

Evaluation Criteria for the Data Management and Statistical Analysis Specialist:

Competency:
Knowledge of CITES, in particular decisions, processes and discussions relating to elephant conservation, trade in elephant specimens, elephant poaching and illegal trade in ivory [Resolution Conf. 10.10 (Rev. CoP18)] is desirable.

Skills:
i) Expertise in statistical modelling and interpretation, specifically the use of Bayesian hierarchical models, and in reviewing statistical methodology
ii) Expertise in database management and maintenance

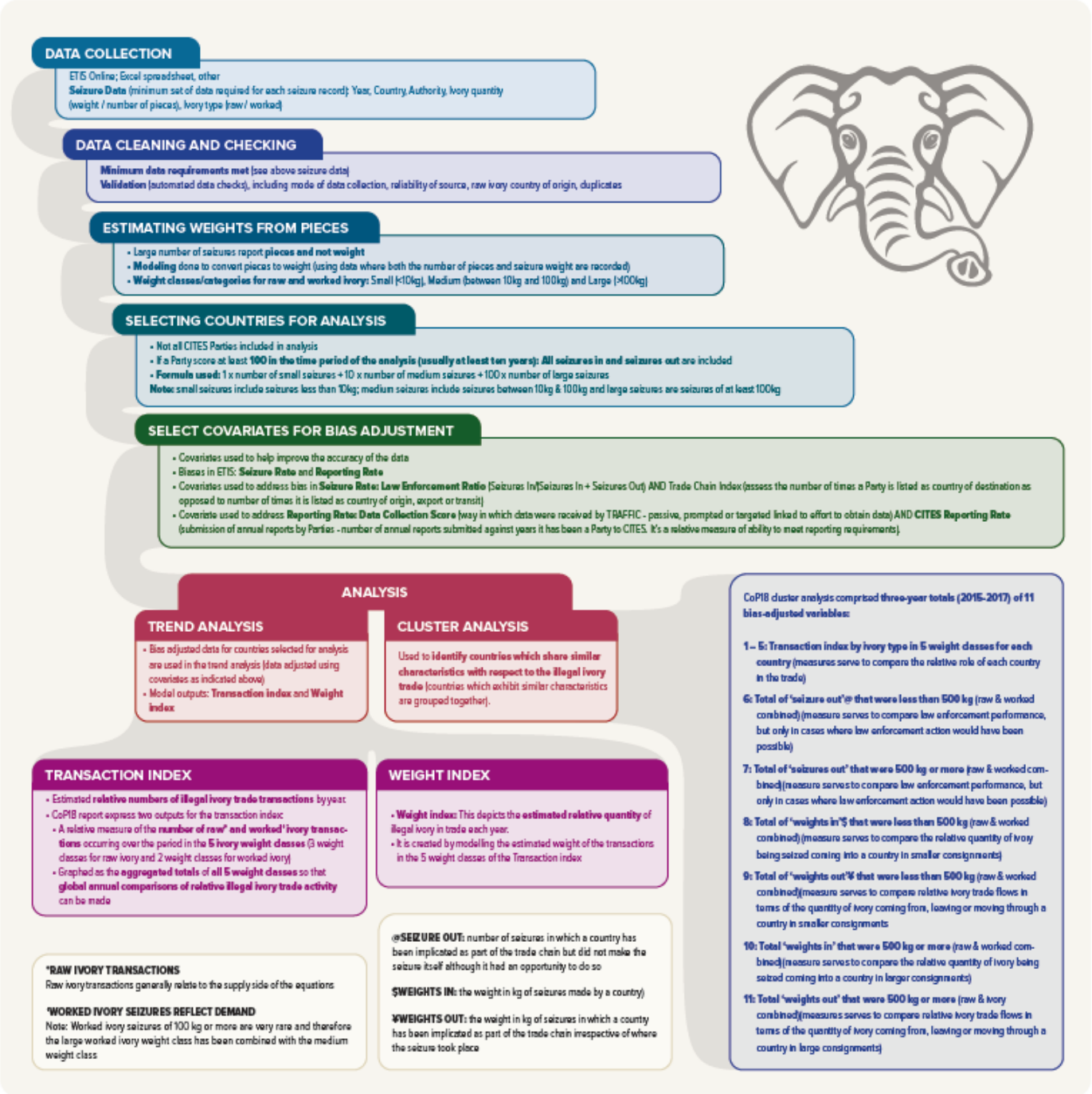
Academic Qualifications:
Advanced university degree (Master's degree or equivalent) in statistics, or a related subject.

Experience:
i) Extensive experience of applying modern statistical methods to produce pragmatic solutions to real world problems
ii) Experience in managing the collection and processing of data and its flow through a system to provide information to policy makers at national and international level
iii) Experience in statistical modelling and interpretation, specifically the use of Bayesian hierarchical models, and in reviewing statistical methodology

Language:
English and French are the working languages of the United Nations Secretariat. English, French and Spanish are the working languages of CITES. Fluency in English is required. Knowledge of French or Spanish is desirable.

Annex B: ETIS in a Nutshell

ETIS in a Nutshell.pdf



INTERPRETATION / DESCRIBING RESULTS

Groups identified through the cluster analysis (dendogram) are described, taking into consideration / using explanatory variables and expert opinion / knowledge:

- Aggregated summary statistics of raw data based on or derived from the original ETIS data, prior to adjustment (Reasoning: Using summaries of the original data as provided by the Parties is the best way to explain the characteristics of the clusters).
- Other independent sources of data such as the corruption measure of Transparency International or the domestic ivory market score (Reasoning: Data from these sources implicitly serve to comparatively assess the domestic environment in which illegal ivory trade unfolds at a comparative national scale)

Single country clusters: The statistics reflect the data for that particular country only. Clusters comprised of two or more countries: The statistics represent the mean of all constituent components.

Explanatory variables:

- **Measure of Frequency: Mean number of seizures** – Frequency is measured by the 'mean number' of reported seizures in the period 2015 – 2017 (i.e., the total number of all seizures which were made by, or have implicated, each country/territory in the group divided by the number of entities in the cluster). High numbers indicate greater frequency; low numbers indicate lesser frequency.
- **Measure of Scale: Mean weight (kg)[2]** – Measured by the 'mean estimated weight' of reported seizures in the period 2015 – 2017 (i.e., the total estimated weight of ivory represented by all seizures which were made by, or have implicated, each country/territory in the group divided by the number of entities in the cluster). High numbers indicated greater weights of ivory; low numbers indicate lesser weights of ivory.
- **Measures of Law Enforcement Effort Efficiency:**
  - **Mean CPI** – Law enforcement effort, effectiveness and rates of reporting is measured by the mean Corruption Perception Index of Transparency International (i.e., the total CPI score for each country in the period 2015 – 2017 divided by the number of countries / territories in the cluster divided by the number of years) Scores ranges from 1 (weakest governance performance) to 100 (strongest governance performance)
  - **Mean Law Enforcement Ratio** – Law enforcement effort, effectiveness and rates of reporting is measured by the 'mean LE Ratio" in the period 2015 – 2017 (i.e., the total number of in-country seizures divided by the total number of seizures which were made by, or have implicated, each country / territory in the group divided by the number of entities in the cluster). Ratios range from 0.00 (no law enforcement effort) to 1.00 (best law enforcement effort).
- **Measure of Organized Crime: Proportion of large-scale ivory seizures to mean weight.** Involvement of organized crime is measured by taking the proportion of the mean weight in reported seizures that represent large-scale seizures in the period (2015 – 2017) (large scale seizures – those seizures which are equal to or greater than 500 kg of ivory weight in which a particular country/territory either made or was implicated in).

High values suggest the presence of organized crime in the movement of ivory; low values suggest the absence of organized crime in the movement of ivory.

- **Measure of Domestic Ivory Trade:** Mean market score. Domestic ivory trade is measured by the 'mean market score'.

NOTE: The score is informed by TRAFFIC market surveys and other information relating to markets gathered by researchers and NGOs or expert opinion / knowledge Scores range from 1 (no domestic ivory market) to 9 (very large domestic ivory market)

ASSESSING RESULTS OF THE CLUSTER ANALYSIS: CATEGORIZATION IN NIAP CATEGORIES

- TRAFFIC assesses the results of the above process and categorize countries.
- In CoP18 report, the following were included in terms of rationale / reasons for placing countries in the various NIAP categories (NOTE: There are no fixed criteria for each category):

Category A Parties (Parties most affected by the illegal trade in ivory):

- Highest seized and reported estimated ivory weight in the time period (2015 – 2017), including large-scale seizure events.
- Generally low LE ratio and CPI scores
- Illegal domestic markets of concern (exceptions mentioned)
- Country specific considerations – increases in total weight of ivory seized; ivory processing / manufacturing and illegal retail outlets (trade domestically and cross-border (references to market surveys/studies)); information relating transit through specific countries (consolidation and distribution points); source and export countries (mostly range States)

Category B Parties (Parties markedly affected by the illegal trade in ivory):

- High seized and reported estimated ivory weight in the time period (2015 – 2017), including large scale movements of ivory
- High LE ratio values (Scale of involvement in illegal ivory trade is significant but countries exhibit high LE ratio values): This was the characteristic that separated the Parties from those in Category A.
- Other considerations: CPI and domestic ivory market score (corruption and demand)

Category C Parties (Parties affected by the illegal trade in ivory):

- Particular characteristics which merit careful tracking (Countries identified in various groups from the cluster analysis)
- Characteristics referred to in CoP18 report: Major sources of ivory (elephant populations experienced major declines; high PIKE values); relatively high weight values in the period 2015 – 2017; export of commercial shipments of worked ivory; transit countries; stockpiles; ivory trade flow information; end-use destinations with growing domestic ivory markets.
- References: Studies by individuals, NGOs and reports by CITES Secretariat

Annex C: Documents Consulted

No.	Document Name
Root	
1.	E-CoP17-Inf-67 - China & responses.pdf
2.	E-Notif-2019-046 ETIS & MIKE programming code.pdf
3.	E-Notif-2020-ETIS questionnaire-Annex-FInal.docx
4.	E-Res-10-10-R18.pdf
5.	E-Res-14-03-R18 CITES compliance procedures.pdf
6.	E-SC69-Inf-47 - singapore and malaysia.pdf
7.	ETIS review - Key issues (CITES meeting_8 July 2020).docx
8.	Methods Paper_Burn_Underwood_Technical_Report…I_ivory_trade.pdf
9.	MIKE ETIS Subgroup ToR .pdf
10.	MIKE ETIS TAG ToR.pdf
11.	Presentation - General Background CITES .pptx
12.	R8_IvoryGuide_07162020_low-res.pdf
13.	understanding-etis-vfinal-web.pdf
14.	Discussion-data access form.docx
15.	DRAFT revised ETIS Data Request Form_Dec 2019 TO.docx
16	Methods Paper_Dissecting the Illegal Ivory Trade_An Analysis of Ivory Seizures (2)
17.	Methods Paper_Burn_Underwood_Technical_Rep…I_ivory_trade.pdf
18.	Methods Adjustments_Comments on Methods in…CITES CoPs.docx
19.	CoP18 R scripts_ E-Notif-2019-046 Github links to ETIS code.pdf
20.	CoP18 R scripts_Notes on R scripts used in CoP1…ETIS analysis.pdf
21.	Criticisms_Annex E_ETIS report analysis_SG challenge.pdf
22.	Response to Criticisms_Underwood Proposal Res…est Redacted.pdf
23.	Responses to Criticisms_E-SC69-Inf-22 TRAFFIC_TA…ponse to SG.pdf
24.	Responses to Criticisms_E-CoP18-Inf-093 ETIS Inf document.pdf
25.	FMU_RWB Response ETIS Internal Review.pdf
26.	SC73 ETIS report final 25 Aug 2020.docx
27.	ETIS review-2019-11-16[1].docx
28.	E-CoP17-Inf-42.pdf
29.	E-CoP17-Inf-67.pdf
30.	E-CoP18-Inf-093.pdf
31.	E-SC69-Inf-22.pdf
32.	E-CoP16-53-02-02.pdf
33.	E-CoP17-57-05-Add.pdf
34.	E-CoP17-57-06-R1.pdf
35.	E-CoP18-069-01-Add (Annual Illegal Trade report & E…IS reporting).pdf
36.	E-CoP18-069-03-R1.pdf
37.	E-CoP16-26 Revision of Res Conf 10.10.pdf
38.	E15-18A07 (need for review of Res Conf.10.10).pdf
39.	Res Conf 10.10 (Rev CoP 14).pdf
40.	Res Conf 10.10 (Rev CoP11).pdf
41.	Res Conf 10.10 (Rev. CoP12).pdf

42.	Res Conf. 10.10 (Rev CoP16).pdf
43.	Res Conf. 10.10 (Rev CoP17).pdf
44.	Res Conf. 10.10.pdf
Articles	
45.	10.1016@j.jeconom.2019.11.pdf
46.	chan2016.pdf
47.	Deviance information criterion for Bayesian model selection_ Just.pdf
48.	An Analysis of Ivory Seizure Data Oct2013journal.pone.0076539.PDF
49.	journal.pone.0076539.pdf
50.	-Elephants in the dust_ the African elephant crisis-2…theDust copy.pdf
51.	World_Wildlife_Crime_Report_2016_final.pdf
52.	E-SC69-29-03-A-05.pdf
53.	SINGAPORE ETIS REPLY.pdf
Notifications	
54.	CITES-NIAP dossier.pdf
55.	Considering the finger Nigeria (ETIS).docx
56.	E-Notif-2019-009.pdf
57.	SINGAPORE ETIS REPLY.pdf
58.	Singapore's observations on ETIS review 25022019.pdf
59.	对方法的意见-EN (China).docx
60.	E-Notif-2020-005-A1.docx
61.	E-Notif-2020-005-A2.pdf
Forms	
62.	3 English ETIS data collection electronic form.pdf
63.	4 English ETIS explanatory notes.pdf
64.	ETIS-standard-spreadsheet.xls
65.	Illegal trade report Guidance E-Notif-2019-072-A2.pdf
66.	Re_ [MIKE-ETIS TAG] Review of supporting informat…lysis R code.eml
67.	CITES_secretariat_organigrammes_v1_04122018.pdf
68.	CITES-Convention-EN.pdf
Others	
69.	SoPs outline Final draft Feb_2020-updates_FU_TM-LS_REV_12_03_2020.docx
70.	SoPs FMU revisions 20200217.docx
71.	TAG16 Draft Minutes July 2020 - All sessions_SBM.docx
72.	ETIS Online User Guide_v1_09_2020.docx
73.	ETIS website modifications example after external review call.pptx
74.	Underwood Foresnsics.pdf
75.	Functional Specification Final version.doc
76.	Daniel Stiles, Rowan Martin and Brendan Moyle (2015). Analysis of Ivory Demand Drivers - Draft
77.	UNODC, World Wildlife Crime Report 2020: Trafficking in Protected Species
78.	TRAFFIC: The Global Ivory Trade - https://www.traffic.org/what-we-do/perspectives/the-ivory-trade/
79.	Yufang, Gao & Clark, Susan. (2014). Elephant ivory trade in China: Trends and drivers. Biological Conservation. 180. 23–30. 10.1016/j.biocon.2014.09.020.

Annex D: Interview Sessions Informing the ETIS Review

No.	Date	Stakeholder	Participant(s)
Inception phase			
1.	25 June 2020	CITES Secretariat	• Ms. Thea Carroll - CITES MIKE Coordinator
2.	3 July 2020	TRAFFIC	• Mr. Steven Broad - Executive Director • Ms. Thomasina Oldfield - Director of Programmes and Research • Ms. Louisa Sangalakula - Programme Officer • Ms. Sharon Baruch-Mordo - Senior Analyst, Elephant and Rhino Trade
3.	8 July 2020	CITES Secretariat	• Ms. Ivonne Higuero - Secretary General • Mr. Juan-Carlos Vasquez - Chief Legal Affairs and Compliance • Mr. Barend Janse van Rensburg - Chief Enforcement Support • Mr. Tom De Meulenaer - Chief, Scientific Services • Mr. Johannes Stahl - Compliance Support Officer • Ms. Pia Johnsson - Enforcement Support Officer
4.	9 July 2020	TAG Member	• Dr. Holly Dublin
5.	10 July 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst, Elephant and Rhino Trade
6.	22 July 2020	TAG Members	• Dr. Carl Schwarz • Dr. Andy Royle
7.	12 August 2020	TRAFFIC (former)	• Mr. Tom Milliken, Elephant and Rhino Programme Leader
Fact-finding phase			
CITES Secretariat			
8.	11 September 2020	CITES Secretariat	• Ms. Thea Carroll - CITES MIKE Coordinator
9.	01 October 2020	CITES Secretariat	• Ms. Thea Carroll - CITES MIKE Coordinator
10.	01 October 2020	CITES Secretariat	• Mr. Johannes Stahl - Compliance Support Officer
11.	9 October 2020	CITES Secretariat	• Mr. Tom De Meulenaer - Chief, Scientific Services

12.	14 October 2020	CITES Secretariat	• Mr. Barend Janse van Rensburg - Chief Enforcement Support • Ms. Pia Johnsson - Enforcement Support Officer
13.	20 October 2020	CITES Secretariat	• Ms. Thea Carroll - CITES MIKE Coordinator
14.	29 October 2020	CITES Secretariat	• Ms. Ivonne Higuero - Secretary General
CITES National Management Authorities			
15.	18 September 2020	CITES Management Authority: Federal Republic of Nigeria - Department of Forestry	• Mr. Timothy Daniel John • Mr. Rasak Kolawole Adekola • Ms. Tessy Imogie
16.	21 September 2020	CITES Management Authority: Republic of Singapore - National Parks Board	• Ms. Janice Yap Ms. Renhui Xie • Ms. Anna Wong • Mr. Gerald Neo
17.	21 September 2020	CITES Management Authority: Republic of Uganda - Department of Wildlife Conservation, Ministry of Tourism, Wildlife and Antiquities	• Mr. Barirega Akankwasah • Mr. Charles Thumwesigye
18.	22 September 2020	CITES Management Authority: People's Republic of China - Department of Wildlife Conservation / The Endangered Species Import and Export Management Office of the People's Republic of China	• Mr. Su Rui • Mr Wu Zhongze • Dr. Ping Xiaoge
19.	22 September 2020	CITES Management Authority: United Republic of Tanzania - Wildlife Division, Ministry of Natural Resources and Tourism	• Mr. Eligi P. Kimario
20.	23 September 2020	CITES Management Authority: Republic of Kenya - Kenya Wildlife Service	• Mr. Patrick Omondi • Mr. Solomon Kyalo • Mr. Sospeter Kiambi
21.	24 September 2020	CITES Management Authority: Republic of South Africa - Department of Environmental Affairs, Biodiversity Compliance Monitoring and Enforcement	• Ms. Sonja Meintjes
22.	28 September 2020	CITES Management Authority: Federation of Malaysia - Ministry of Energy and Natural Resources, Biodiversity and Forestry Management	• Mr. Kamarul Ikram bin Abdul Halim • Mr. Pazil Bin Abdul Patah • Ms. Norsham binti Abdul Latip • Ms. Farrah Shameen binti Mohamad Ashray • Mr. Abdul Rahman bin Abdul Aziz

23.	28 September 2020	CITES Management Authority: Socialist Republic of Vietnam - Viet Nam CITES Management Authority, Ministry of Agriculture and Rural Development	• Mr Vuong Tien Manh • Mr. Anh Tuan Nguyen
24.	28 September 2020	CITES Management Authority: Republic of Mozambique - Ministry of Land and Environment, National Administration of the Conservation Areas	• Mr. Nunes Tomas Mazivile
25.	29 September 2020	CITES Management Authority: - Kingdom of Thailand - Department of National Parks, Wildlife and Plant Conservation, CITES Office	• Ms. Klairoong Poonpon
26.	30 September 2020	CITES Management Authority: Togolese Republic - Direction des Ressources Forestières, Ministère de l'Environnement, du Développement Durable et de la Protection de la Nature	• Dr. Amah Atutonu • Lt/Col Adjei-Toure Issobou • Cdt. Aboudou Mensa
27.	5 October 2020	CITES Management Authority: Republic of Zimbabwe - Parks and Wildlife Management Authority	• Ms. Patience Gandiwa • Ms. Roseline Mandisodza-Chikerema
28.	6 October 2020	CITES Management Authority: Kingdom of Belgium - Directorate General Environment, Service Multilateral and Strategic Affairs CITES Unit	• Ms. Miet Van Looy
29.	7 October 2020	CITES Management Authority: Gabonese Republic - Ministère de la Forêt, de l'Environnement et de la Protection des Ressources Naturelles	• Mr. Serge Mibambani
TRAFFIC			
30.	25 August 2020	TRAFFIC	**Review of ETIS Online Database:** • Ms. Louisa Sangalakula - Programme Officer • Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
31.	28 August 2020	TRAFFIC	**Review of ETIS Online Database Admin Dashboard:** • Ms. Louisa Sangalakula - Programme Officer • Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
32.	4 September 2020	TRAFFIC	**Primer on ETIS Data Structure, SQL File and R-Code**:

			• Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
33.	02 October 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
34.	20 October 2020	TRAFFIC	• Mr. Steven Broad - Executive Director • Ms. Thomasina Oldfield - Director of Programmes and Research
35.	20 October 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
36.	23 October 2020	TRAFFIC (former)	• Mr. Tom Milliken, Elephant and Rhino Programme Leader
37.	23 October 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
38.	02 November 2020	TRAFFIC	• Ms. Louisa Sangalakula - Programme Officer
39.	24 November 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
MIKE-ETIS Subgroup / TAG			
40.	24 September 2020	Chair MIKE-ETIS Subgroup (former)	• Mr. Basile van Havre
41.	05 November 2020	TAG Member	• Dr. Holly Dublin

Annex E: Interview Protocol for Consultations with Parties

This protocol is a generic one and was somewhat adapted, along with the supporting questions, for each CITES Management Authority met during semi-structured interviews.

Message sent to Parties
As you are aware, the CITES Secretariat was requested by the 70th meeting of the Standing Committee to: "*i) subject to external funding, appoint a group of independent experts to carry out the review of the ETIS programme under the oversight of the MIKE and ETIS Subgroup and a nominated member of the MIKE and ETIS Technical Advisory Group*" (*SC70 SR*)."

At CoP18, CITES Parties also adopted Decisions 18.18 – 18.20 on the Review of the ETIS programme:

Decision 18.18
Decision directed to: Secretariat

The Secretariat shall include in the terms of reference for the review of the Elephant Trade Information System (ETIS) programme, the issue of overlapping reporting requirements created under Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens and Resolution Conf. 11.17 (Rev. CoP18) on National reports and the challenges posed by the different data-sharing policies, and work closely with the consultants carrying out the review to identify possible solutions.

Decision 18.19
Decision directed to: Secretariat

The Secretariat shall report the findings of the review of the ETIS programme requested by the Standing Committee, and any recommendations emanating from the review, at the 73rd meeting of the Standing Committee.

Decision 18.20
Decision directed to: Standing Committee

The Standing Committee shall review the findings and recommendations reported by the Secretariat in accordance with Decision 18.19 and make recommendations for consideration at the 19th meeting of the Conference the Parties.

The CITES Secretariat appointed the following two consultants to carry out the review:
Ms. Daniela di Filippo will be responsible for the data management and statistical analysis part of the review;
Mr Camillo Ponziani will be responsible for the governance and business process review.

As part of the review the consultants will engage some CITES Parties. Your country has been highlighted in the ETIS analysis to CoP18 as a Category "X" country, is an African

elephant range State and has participated in discussions relating to the ETIS review. It will be appreciated if you could indicate whether you are interested in and available for an online discussion with the consultants? If so, please let me know whether **Day of Week, Day Month Year at Time** will be acceptable for the online discussion?

Context and Guidance Provided to Parties at Interview

- The interview is confidential;
- While you will be named as a key informant of the ETIS review in our list of consulted stakeholders, your specific contribution and any concerns raised will be anonymous. We will not associate your name with anything specifically included in the ETIS review report;
- You will have received the questions in advance which have been designed to cover the range of issues addressed by the review. Notwithstanding, you are welcome to bring up any issues or concerns over and above the questions;
- We will try to keep the interview capped at one hour in length, but you are free to contact the consultants thereafter should anything else come to mind;
- The review team may contact you to verify anything that came out of this session or cross reference anything that may come out of subsequent interviews which may be relevant to your contribution;
- The questions will be used to guide the discussion through a more conversational exchange – ideally keeping fairly closely to the order of questioning.

Interview Questions

1. What do you think about the significance of ETIS and the manner in which the ETIS analysis is used to inform decision making by CITES Parties relating to, among others, the National Ivory Action Plan? Do you think the process is robust and transparent?
2. Do you believe the online access to all your validated and / or pending data will facilitate timely reporting and the use of ETIS data to inform enforcement in your country?
3. How should communication relating to the ETIS data, as well as the analysis with CITES Parties, be improved?
4. Are ETIS' supporting processes, deadlines for reporting data and governance generally well-documented and clear? How would you recommend improving things if there is a gap?
5. Are there any redundancies and duplication of efforts with other CITES activities and requirements? If so, how would you suggest optimizing this?
6. Do you believe the online access to the statistical code used to inform the ETIS report to CITES meetings of Conference of Parties and Standing Committees would establish a good foundation towards transparency and constructive feedback for further improvements?
7. Do you think the ETIS methodology is clear? Does it allow you to understand the analysis produced and their implications? If not, why is it not clear to you?
    A. Only statisticians can really understand the ETIS methodology.
    B. You understand statistical methods but still the ETIS methodology is not clear.
    C. Other.

8. In terms of data collection, what do you think would be a key factor that ETIS should implement in order to raise the response rate (improve the rate of submission) of ETIS data (seizure data)?
9. The timeframe for submission of ETIS data (within 90 days of seizures occurrence) seems to create some challenges. This also differs from the deadline for the submission of the annual illegal trade reports that should be submitted by October each year (for the preceding year). What would be your suggestion in order to eliminate double/parallel reporting?
10. Do you think the ETIS analysis are based only on factual information and data submitted by Parties? There are qualitative elements, such as market information and other reports that are referenced especially in the sections where the Categories are discussed (assessment of the cluster analysis) – are the sources clear and are you able to distinguish between qualitative information and expert opinion? Are the criteria or reasons why a country is placed in a specific NIAP category (category A, B, C) clear to you?
11. In terms of Resolution 10.10 (Rev. CoP18) TRAFFIC is responsible to manage and coordinate ETIS. In your opinion, are there any other possible options / models?
12. Do you have any concerns in relation to the fact that data governance, analytics and reporting are managed by TRAFFIC? If so, what are your concerns and what would be your recommendation to address these?

Annex F: Examples of Delays Encountered by the Consultants in the Receipt of Key Information to Support the ETIS Review

No.	Request	Requested from TRAFFIC	Received
Governance and Business Process Specialist			
1.	Review of high-level ETIS system diagram	9 September 2020	30 November 2020
2.	Validation of 3 flows: • enter single seizure record • upload seizure records MS Excel file • View and Action Pending Seizure Record	22 September 2020	6 November 2020
3.	Articulation of plan for ETIS upgrades in 2020 and 2021 and description of process by which these will be prioritized	7 August 2020	21 December 2020
4.	Database relationship diagram / database schema	16 July and 18 August 2020	Not received
Data Management and Statistical Analysis Specialist			
5.	Validation of the R code developed to run queries	22 October 2020	Issues resolved via meeting with Louisa on 2nd November 2020
6.	The order of the R scripts for the Trend analysis	19 October 2020	19 January 2021
7.	Answers to the questions intended for Fiona on the statistical model that were sent to TRAFFIC for a response	19 October 2020	9 November 2020

Annex G: PowerPoint Presentation of Preliminary Findings and Observations

Preliminary Findings -
CITES Secretary Gener

Annex H: Short and Long-Term ETIS Development Plan

ETIS near-term tasks:

1. Fix ETIS Online release bugs by S-Branch.
2. Work with S-Branch to manage new issues with user registration of ETIS Online (e.g., block bots), and to implement new scheduling email system with notifications to CITES Management Authorities, the user/applicant, and CITES Secretariat to maintain timely management of registration process.
3. Finalize with Secretariat CITES-ETIS website.
4. Revise SoP to reflect new ETIS Online data collection and any other updates.
5. Work with the CITES Secretariat to release CITES notification for ETIS data collection form in early 2021.
6. Concurrently to notification, outreach to Parties to introduce ETIS Online and seek missing data for past years; offer support and training for ETIS Online.
7. Address any outstanding and ongoing data queries from CITES Parties or external Parties.
8. Outreach internally to TRAFFIC offices to gather ivory market survey data.
9. Outreach to key Parties (e.g., the Netherlands, USFWS) to raise funds for future operations of ETIS.

Longer-term tasks (and especially as past 2018-2020 data arrives)

1. Re-run trend analyses to at least include more complete 2018-2019 data and consult with TAG statisticians to:
    a. Assess model fit to large weight classes;
    b. Address true zeros versus non-reporting;
    c. Implement any suggested changes by ETIS external review team.
2. Cluster analysis code review and implementation by new analyst.
3. Pursue modeling exploration of the impact of removing lower source grades (B and C) data from trend analyses.
4. Revisit covariates used in analysis especially following the release of ETIS Online (reporting rate covariates), and possibly pursue mechanistic covariate modeling.
5. Throughout the modeling review and implementation process, engage in discussions with Tom Milliken and Fiona Underwood to fill in any remaining gaps (given both were unavailable when new analyst started).
6. Produce any required reports/proposals to funders and to the CITES Secretariat.

Annex I: List of Documents Raising Major Concerns on the Analytics Methodology and Responses to Issues Raised

Criticisms on the ETIS Methodology by Parties:

- 'Singapore's observations on ETIS review 25022019'
- 'CITES-NIAP dossier'
- 'Criticisms_Annex E_ETIS report analysis_SG challenge'
- '对方法的意见-EN (China).docx'

Some Responses to Criticisms on the ETIS Methodology:

- 'Responses to Criticisms_E-SC69-Inf-22 TRAFFIC_TAG response to SG': RESPONSE BY TRAFFIC AND THE MIKE-ETIS TECHNICAL ADVISORY GROUP (TAG) TO SINGAPORE'S COMMENTS ON ETIS METHODOLOGY'

- 'E-SC69-Inf-22' : Comments from TRAFFIC and the MIKE-ETIS Technical Advisory Group (TAG) on SC69 Doc. 29.3 Annex 5 submitted by the Government of Singapore on Issues Relating to the ETIS Analysis Submitted to CoP17

- 'E-CoP17-Inf-67': COMMENTS FROM THE MIKE-ETIS TECHNICAL ADVISORY GROUP (TAG) ON COP17 INF. 23. Comments from the MIKE-ETIS Technical Advisory Group (TAG) on CoP17 Inf. 23 submitted by China on Behalf of the China Wildlife Conservation Association (CWCA) Concerning

- 'Responses to Criticisms_E-CoP18-Inf-093 ETIS Inf document': TRAFFIC FEEDBACK ON ISSUES RAISED IN THE DISCUSSION OF THE ETIS REPORT PRESENTED IN COP18 DOC. 69.3 (REV. 1) IN COMMITTEE

Annex J: Ivory Seizure Data Analysis Proxy Variables

Candidate variables for predictors of seizure and reporting rates

Description	Source	Proxy
Corruption Perceptions Index, CPI	Transparency International	LE effectiveness
Control of corruption	World Bank	LE effectiveness
Government effectiveness	World Bank	LE effectiveness
Political stability	World Bank	LE effectiveness
Rule of law	World Bank	LE effectiveness
Regulatory quality	World Bank	LE effectiveness
Voice & accountability	World Bank	LE effectiveness
Gini coefficient	World Bank Poverty Indicators	LE effectiveness
Trade Chain Index	ETIS	LE effectiveness
Per capita gross domestic product, GDP	IMF	Economic development
Human development index	UNDP	Social development
Legislation score	CITES Secretariat	Importance of wildlife crime
LE ratio previous year	ETIS	LE effort
Data collection score	ETIS	Data collection effort
CITES reporting score	ETIS CITES	Compliance with CITES reporting requirements

Proxy for Seizure Rate
Proxy for Reporting Rate

Annex K: Proposed Amendments to Annex 1 to Resolution Conf. 10.10 (Rev.CoP18)

Note to reader: text proposed to be deleted is ~~crossed out~~. Proposed new text is underlined.

Annex 1 **Monitoring illegal trade in ivory and other elephant specimens**

1. Introduction

In order to monitor and record levels of illegal trade in ivory and other elephant specimens on a global basis, there is a need for a system to collect and compile law enforcement data on seizures and confiscations. At its 10th meeting, the Conference of the Parties recognized the Bad Ivory Database System (BIDS) established by TRAFFIC for this purpose in 1992.

Through further development and refinement, BIDS evolved into the Elephant Trade Information System (ETIS), which has been used to monitor the pattern and scale of illegal trade in ivory and other elephant specimens since 1998.

2. Data scope

ETIS is a comprehensive and global information system whose central feature is a database holding the details of law enforcement records for seizures or confiscations of elephant ivory and other elephant specimens which have been reported to occur since 1989. ETIS also maintains a series of subsidiary information on law enforcement effort and efficiency, rates of reporting, legal and illegal elephant product markets, governance issues, background economic data, derived measures, and other factors to enable the statistical analysis and its interpretation.

The following data on domestic and international seizures of illegal trade in elephant ivory and other elephant specimens are collected by TRAFFIC in collaboration with the CITES Secretariat (minimum information required to enable data entry of a seizure case into ETIS denoted by an asterisk):

- source of information*
- date of seizure*
- agency responsible for seizure*
- type of transaction
- country of seizure*
- country of origin
- country of export
- country of transit
- country of destination/import
- type of ivory and quantity*
- type and/or quantity of non-ivory elephant products*
- mode of transport
- modus operandi
- nationality of suspects

Upon consultation with the MIKE and ETIS Technical Advisory Group (TAG), the above list of minimum required information as well as subsidiary information may be revised and updated

as necessary to improve the analysis and the resulting output and interpretation. Parties will be informed about the additional data elements to be added through a Notification.

3. ~~Methods~~ Data governance

~~Data and information on illegal trade in elephant ivory and other elephant specimens will be collected by TRAFFIC in collaboration with the CITES Secretariat. In this regard, a standardized methodology has been developed for the collection of data, including, inter alia and to the extent known:~~

~~Standardized data are collected through a number of mechanisms and formats, including direct online data submission to the ETIS website, using the ETIS Data Collection Form for individual seizure cases or the ETIS Data Collection Spreadsheet for reporting multiple seizure cases at one time. Reporting on elephant product seizures or confiscations using other formats is also acceptable.~~

Data ownership:

The detailed data on individual seizure cases submitted to ETIS are owned by the respective CITES Parties. Each Party has data ownership accountability over the data submitted by them. The CITES Secretariat has data ownership accountability for all other derived data/information/measures through ETIS. Data owners are accountable for the quality and integrity of their own data; however, the day-to-day data management activities may be delegated to the data stewards.

Data stewardship:

Data stewardship is the management of data and information, including content and metadata, on behalf of the data owners to ensure high quality data, required controls and data integrity in accordance with the data scope. The CITES Secretariat is the primary data steward of all ETIS data; all data management responsibilities are delegated to TRAFFIC who will be responsible for the definition and management of the ETIS data lifecycle and data governance in consultation with the CITES Secretariat. Data governance will address sensitive and non-sensitive information collected and the use of this data, taking into consideration paragraph 27 g) of the Resolution.

Oversight and accountability:

Roles, responsibilities and accountability of data owners and stewards will be identified for all ETIS data with transparent and effective communication on all matters relating to data controls and governance being made available on the ETIS Online system and the CITES website.

4. Data collection and compilation

The MIKE and ETIS Technical Advisory Group (TAG) will support the development and implementation of ETIS. ETIS will be managed and coordinated by TRAFFIC in consultation with the TAG and in collaboration with the CITES Secretariat.

All Parties, through their CITES Management Authorities, following liaisons with appropriate law enforcement agencies, should provide information on seizures and confiscations of ivory or other elephant specimens in the prescribed formats, either to the Secretariat or directly to TRAFFIC within 90 days of their occurrence. In addition, law enforcement agencies in States not-party to the Convention are requested to provide similar information.

TRAFFIC will assist the Parties in collecting data, ensuring data quality and consistency, and providing tools and training in data collection, data utilization and information management to designated officials around the world as appropriate.

Standardized data will be collected through several mechanisms and formats, including direct online data submission to the ETIS website, using the ETIS Data Collection Form for individual seizure cases or the ETIS Data Collection Excel template for reporting multiple seizure cases at one time. Reporting on elephant specimen seizures or confiscations using other formats is acceptable but not recommended.

5. Information, data analysis and interpretation

Information generated by ETIS is hereby defined as the outcomes and outputs of ETIS data analysis, including summaries and aggregates in different forms, trends and other analytical presentations, and the relationships and factors which comprise underlying trade dynamics.

The analysis and interpretation of data will be coordinated by TRAFFIC in association with the CITES Secretariat and MIKE (see Annex 2), and in consultation with the relevant Parties and the TAG. The statistical methodology, underlying code, and supporting documentation will be made available to all Parties. The statistical modelling and techniques will be reviewed and refined as deemed necessary by the TAG and TRAFFIC and submitted to the MIKE-ETIS Subgroup of the Standing Committee for consideration.

6. Intersessional Remedial Action

In the event that there is a need for urgent intersessional action, TRAFFIC will report as appropriate to the Standing Committee via the Secretariat.

7. Funding

Regular funding should be secured ~~A funding mechanism will be established~~ to ensure that ETIS ~~is fully operational~~ can meet minimum operational requirements to deliver on the objectives in paragraph 27 a).

Annex L: Complimentary Recommendations from the Statistical Report

The file below has been included at the request of the CITES Secretariat and includes complimentary recommendations from the Data Management and Statistical Analysis Specialist. The recommendations therein do not necessarily reflect the views and findings of the Governance and Business Process Specialist, nor have they been jointly discussed and agreed to.

Summary_Recommendations_Sept2021.d

Annex M: Statistical Review of the Elephant Trade Information System: Data Management and Statistical Analysis

Stat report reviewed_Sept 2021.

Annex N: Proposed changes to Res Conf. 10.10 (Rev. CoP18) and Res Conf. 11.17 (Rev. CoP18) on National Reports

Note to reader: Proposed new text is underlined.

Resolution Conf. 11.17 (Rev. CoP18) – paragraph 4. to be amended as follows:

4. AGREES that, unless otherwise specified by the reporting Party, data collected in the annual illegal trade report and included in the database should be made available to Parties for research and analysis of wildlife and forest crime as it affects them, ~~and~~ to the members of the International Consortium on Combating Wildlife Crime (ICCWC) for ICCWC global research and analysis studies on wildlife and forest crime, and to ETIS, as appropriate, to support the monitoring the illegal trade in ivory and other elephant specimens as provided for in Resolution Conf. 10.10 (Rev. CoP18) ;

Resolution Conf. 10.10 (Rev. CoP18) – paragraph 27 g) to be amended as follows:

27. g) summaries and aggregates of data provided to MIKE and ETIS, and the analyses of such data, constitute information that will be considered to be in the public domain once they are published on the CITES website, or otherwise publicly distributed; the detailed data on individual seizure cases, elephant mortalities and law enforcement submitted to MIKE or ETIS are owned by the respective data providers, which in most case are the CITES Parties; any such data relating to a CITES Party will be accessible to that Party, ~~and~~ the members of the MIKE and ETIS Technical Advisory Group for information and review purposes, and the members of the International Consortium on Combating Wildlife Crime (ICCWC) for global research and analysis, but will not be released to any third party without the consent of the Party concerned; data may also be released to contractors (e.g. statisticians) or other researchers (e.g. MIKE ETIS Subgroup approved research collaborations) under appropriate nondisclosure agreements; and

Review of the Elephant Trade Information System (ETIS)

FINAL TECHNICAL REPORT: DATA MANAGEMENT AND STATISTICAL ANALYSIS

SEPTEMBER 2021

This report was prepared under contract from the CITES Secretariat by Daniela Di Filippo, the Data Management and Statistical Analysis Specialist appointed to carry out the statistical review of the ETIS program.

The *Final Consolidated Report of the Review of the Elephant Trade Information System (ETIS)* that includes the analysis of the Governance and Business Process Specialist – Camillo Ponziani and a summary of the analysis of the Data Management and Statistical Analysis Specialist – Daniela Di Filippo, leverages relevant sections from this standalone technical report as needed to fulfill the requirements in the Terms of Reference. This statistical report provides an in-depth study of the statistical concepts expressed in the full report.

The findings, interpretations, and conclusions expressed herein are those of the author(s) and do not necessarily reflect the views of the CITES Secretariat, the United Nations Environment Programme, United Nations or the Parties to the Convention.

This report was produced with the financial support of the People's Republic of China and the Netherlands. Its contents are the sole responsibility of the ETIS Review Team and do not necessarily reflect the views of the hte People's Republic of China and the Netherlands.

The designations employed and the presentation of material on any map in this work do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat, the United Nations Environment Programme or the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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Acknowledgements

The statistical review of the Elephant Trade Information System (ETIS) collected inputs by all the partners, Parties to CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) and ETIS stakeholders involved.

The statistical review of ETIS was carried out by Daniela Di Filippo, the Data Management and Statistical Analysis Specialist, with input where appropriate from Camillo Ponziani, the Governance and Business Process Specialist, and was completed under the guidance of Thea Carrol and the CITES Secretariat.

The authors of the review would like to thank the CITES Secretariat senior management staff who provided their time, expertise and vetting of various materials shared by the consultants during virtual consultations. In addition, the review team would like to thank the staff from TRAFFIC[1], and in particular would like to acknowledge the valuable contributions of Louisa Sangalakula and Sharon Baruch-Mordo.

Special mention for TRAFFIC's former Elephant and Rhino Programme Leader and founder of ETIS Tom Milliken, who gave his time to help track down answers to or point the review team in the right direction for, every question we asked and to discuss the points we took every opportunity to raise and attempted to the best of his ability to stand in for TRAFFIC's statisticians when it was not possible to engage with them. The review team is also grateful to current and former members of the MIKE-ETIS Technical Advisory Group and MIKE-ETIS Subgroup, including Carl Schwarz, Andy Royle, Holly Dublin and Basile Van Havre among others, for the open and frank exchanges.

Finally, the review team is grateful for the inputs received from a number of CITES National Management Authorities who contributed with their thoughts and participate in the review process, including the Kingdom of Belgium, Canada, People's Republic of China, Gabonese Republic, Republic of Kenya, Federation of Malaysia, Republic of Mozambique, Federal Republic of Nigeria, Republic of Singapore, Republic of South Africa, United Republic of Tanzania, Kingdom of Thailand, Togolese Republic, Republic of Uganda, Socialist Republic of Vietnam and the Republic of Zimbabwe.

The review is intended to take stock of what has been achieved by ETIS over its more than twenty years of operations, as well as glean some of the critical lessons that can be learned from it. In this report, the statistical consultant has tried to offer pragmatic recommendations and constructive criticism and sincerely hope that those involved take it as such.

The review team wishes the entire ETIS and CITES Secretariat teams every success in their continued commitment to curtailing the global illegal ivory trade and further growing ETIS as an indispensable tool in informing global decisions affecting elephant conservation.

Daniela Di Filippo
Trani, Italy

Camillo Ponziani
Toronto, Canada

[1] TRAFFIC, the Wildlife Trade Monitoring Network, is a non-governmental organization working globally on the trade of wild animals and plants in the context of both biodiversity and sustainable development that is in charge to analyze and collect ETIS data.

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Executive Summary: Data Management and Statistical Analysis

The Terms of Reference for the ETIS review posed three main questions to the reviewers:

1) Do the processes used by TRAFFIC sufficiently contribute to achieving the objectives of ETIS?
2) Is the ETIS analysis able to support CITES processes and decision making such as the National Ivory Action Plan (NIAP) process as outlined in Annex 3 to Resolution Conf 10.10 (Rev. CoP18)?
3) Are the processes used by TRAFFIC adequately described in Annex 1 of Resolution Conf. 10.10 (Rev. CoP18)? Is there a need to amend Annex 1 of Resolution Conf. 10.10 (Rev. CoP18)?

Based on the statistical review of the processes and systems used by TRAFFIC to collect, validate, manage, analyze and interpret ETIS data, the answers to the above first two questions are:

1) Yes, the processes used by TRAFFIC sufficiently contribute to achieving the objectives of ETIS.
2) Yes, the ETIS analysis is able to support CITES processes and decision making such as the NIAP process, but recommendations are made relating to areas that require strengthening and to address concerns raised by CITES Parties.

As for the third question:

3) Annex 1 of Resolution Conf. 10.10 (Rev. CoP18) should be amended to clarify specific matters, including data governance, Minimum Required Information relating to seizures, and to enhance the role of the MIKE-ETIS TAG in fulfilling its responsibility as contained in its terms of reference. Proposed amendments can be found in Annex B.

The table below reflects the evaluation of the different elements reviewed and discussed in detail in this report with the overall rating being **satisfactory** (for more information please refer to Chapter 7). Each rating is assigned based on the assessment provided in each corresponding chapter.

Summary of Ratings	
Evaluated Processes	***Rating***
1. Data collection	**Satisfactory**
2. Data validation	**Satisfactory**
3. Data management	**Satisfactory**
4. Data analysis (R-code and algorithm used for analysis)	**Satisfactory**
5. Data interpretation	**Moderately Satisfactory**
6. Review of overall ETIS methodology, technical outputs and reports	**Moderately Satisfactory**
Overall review rating	**Satisfactory**

The processes and systems used to collect, validate, manage and analyze ETIS data are fairly well-documented although they are neither organized nor published consistently. Relevant information based on subject area ought to be collated in one single document. TRAFFIC has been able to produce reports for consideration by the meetings of the Conference of Parties (CoP) to CITES and Standing Committee (SC) meetings of CITES as required in Resolution Conf. 10.10 (Rev. CoP18). While the statistical analysis is robust and statistically sound, there is a need to review certain aspects of the methodology and to strengthen overall capacity building and communication. It is important that CITES Parties understand: i) the sources of data used in the analysis, ii) the proxies used to address gaps in the data, and iii) that the interpretation of the results of the analysis is highly reliant / dependent on expert knowledge.

The following key recommendations are extracted from this statistical report:

- *Data collection*
  Parties and TRAFFIC should pay particular attention to the data collection phase of the ETIS programme to ensure timely, precise and complete submission of seizure data in order to support punctual analysis. Failure to address this will undermine the quality of the trends and cluster analysis. TRAFFIC should

furthermore ensure that Parties are aware of, and agree to the use of data obtained from sources other than Parties (i.e., Non-Governmental Organizations, articles, other secondary data sources, etc.). TRAFFIC should explain the various modalities of ETIS data collection, provide training as needed, and ensure that Parties are aware of the peculiarities of each modality used for data submission to ensure Parties use these in the best possible way and according to their organizational needs (e.g. the ETIS Online requires an internet connection while the other two formats (Word and Excel) can be completed without internet connectivity and data can be uploaded when internet connectivity is available. The ETIS Online system facilitates the verification of data by Parties and Parties can access data submitted by them as well as data submitted by other Parties that implicate them in a seizure). A number of aspects require clarification, including the submission of seizure data relating to both national and international seizures; the deadline for submission of data, and the content and use of the subsidiary databases.

- *Data validation*
  Data validation rules should be specified and explained at each statistical phase of the ETIS analysis. The data validation rules should be documented, including the responsibilities of TRAFFIC staff and made available to Parties through the ETIS Online system and/or through other ETIS-related communications. TRAFFIC should consider validating consistency of ETIS data across different databases: internal e.g., Trade in Wildlife Information Exchange data (TWIX) and external e.g., World Custom Organization data (WCO).

- *Data management*
  The CITES Secretariat should have full access to all raw and elaborated seizure data that comprises the ETIS database. The description of Security protocols established by TRAFFIC should be enhanced in the Standard Operating Procedures (SOPs) Manual and additional back-ups of the ETIS database, should be kept by the CITES Secretariat in a secure manner. Proper documentation and tracking should be ensured and described as this is lacking in the current SOPs manual.

- *Data analysis (R-code and algorithm used for the analysis)*
  It is recommended that a full review of the ETIS code should be carried out to modernize execution and coding efficiency. The new version of the code should include the review of the ETIS theoretical framework. Supporting documentation should then be developed for both the improved ETIS theoretical framework and the improved code. The review of the code should include streamlining some processes and scripts. The code published on GitHub did not run smoothly, but the statistical consultant of this review, in collaboration with the TRAFFIC Senior Analyst, produced a version of the code which can be run without any challenges and were able to reproduce the analysis prepared for CoP18.

- *Data interpretation*
  The justification for assumptions made in the overall ETIS process as well as the assumptions associated with covariates used must be clarified, documented, and shared with Parties in each ETIS report prepared for the meetings of the Standing Committee and CoP. Other methods on how to bias-adjust the ETIS data, using a different set of covariates or using other methods other than covariates, should be considered. Some of these are already part of the "Short- and long-term development plan of ETIS/TRAFFIC program" (Annex I). The MIKE ETIS Technical Advisory Group (TAG) should play a more active oversight role in this process.

- *Review of overall ETIS methodology, technical outputs and reports*
  A clear step-by-step description of the ETIS methodology from beginning (data collection) to end (report to Standing Committee/CoP and NIAP categorizations), including all assumptions, should be developed. Various documents have been produced by TRAFFIC, but a comprehensive document describing the whole process from beginning to end is needed. The current Standard Operating Procedure (SOPs) Manual could be used (if appropriately updated) to develop this document. The document must then be made available to Parties through the ETIS page on the CITES website or at least to the MIKE-ETIS TAG. TRAFFIC should furthermore offer online and in person information sessions aimed at explaining the ETIS methodology to interested Parties. Other than improvements in documenting the ETIS methodology, TRAFFIC should reflect on improving the following processes: cluster analysis; measure of domestic ivory trade; use of different sets of covariates over the years; selection of covariates used for ETIS analysis;

data used to inform the categorization of countries; heavy reliance on qualitative analysis despite the availability of a complex statistical methodology; method of selecting countries for ETIS analysis; use of bias-adjusted data and data summary statistics; and ETIS' user awareness about limitations and assumptions of the ETIS methodology.

Preamble

This statistical report provides an in-depth study of the statistical concepts referred to in the consolidated report "Review of the Elephant Trade Information System" prepared by Mr. Camillo Ponziani (Governance and Business Process Specialist) and Ms. Daniela Di Filippo (Data Management and Statistical analysis specialist).

Hence, the ETIS review has produced two reports:

- The Statistical review of ETIS discussed in this report that focuses more on statistical aspects, whose main author is Daniela Di Filippo.
- The consolidated ETIS review which reports the governance and statistical findings whose authors are Camillo Ponziani and Daniela Di Filippo, with a leading role played by Camillo Ponziani.

The review team has practiced objectivity in stating the findings and recommendations and framed them in relation to resourcing, system complexity, data availability, and stakeholder diversity. The ETIS review was conducted between June 2020 and April 2021.

The review was executed across four methodological phases: (a) inception stage and preliminary document review, (b) current state / fact finding stage, including virtual consultations, (c) future state definition stage, including options analysis and gap analysis, and (d) reporting.

It used a mixed-methods approach to collect and triangulate data from different sources, including a documentation review, semi-structured interviews, direct observation and hands-on review of the code, using both quantitative and qualitative techniques. This approach supported the development of robust and evidence-based findings, which in turn allowed for the development of insightful, validated conclusions, and forward-looking recommendations.

The consultants reviewed more than 70 documents, relevant scientific publications, presentations, CoP Resolutions and reports provided to the evaluation team at the outset of the assignment, analyzing them and systematically parsing information related to the evaluation questions. Many more documents were collected, read and discussed in the course of the ETIS review.

Between 25 June 2020 and 24 November 2020, the consultants conducted 41 virtual interviews with over 50 people to gather data, including 9 interviews with the CITES Secretariat, 11 with current members of TRAFFIC, 2 with former TRAFFIC staff, 3 with members of the TAG, 1 with the former Chair of the MIKE-ETIS Subgroup and finally consultations with 15 Parties (priority was given to Parties in the NIAP process or categorized as category A, B or C countries in previous ETIS reports and some members of the MIKE-ETIS Subgroup).

From a business process perspective, the ETIS review has been somewhat of a moving target as there are already important changes introduced or currently being implemented that will address concerns raised by Parties. The recently launched ETIS Online platform includes features that will make the submission and validation of data by Parties more robust, especially in relation to validation of the countries implicated in a seizure recorded by the country of 'Discovery' (country reporting the seizure). In this case, the process has been enhanced through automation.

The ETIS available documentation is extensive and comprehensive but is neither organized nor published consistently. Relevant information based on subject area ought to be collated in one single document. Updates to the supporting documents are often missing and lack proper version control. Comprehensive collection of instructions outlining the methodology and supporting scientific/statistical modeling assumptions in one collated document is absent (i.e., single consolidated update of the Standard Operation Procedures).

More than 70 documents, publications, presentations and reports were provided to the evaluation team, via Dropbox, at the inception phase.

As per the ToR (Annex C) "In undertaking the review indicated above, due consideration should be given to, among others, relevant scientific literature and studies on the statistical analysis of: a. data relating to illegal trade in elephant specimens, b. illegal wildlife trade data, c. other illicit trade data". The following relevant scientific publications are the documents that have influenced the most the formulation of the recommendations provided in this statistical review along with the preparation of the chapters. An additional and more complete list of the documents consulted can be found in the Annex D.

- The UN Principle Governing the International Statistical activities https://unstats.un.org/unsd/methods/statorg/Principles_stat_activities/principles_stat_activities.asp
- The UN fundamental principles of National Official Statistics https://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx
- How the latest UN statistics on SDGs data were conducted https://unstats.un.org/sdgs/report/2020/
- OECD statistics manuals by topic https://www.oecd.org/statistics/statisticalmanualsandguidelinesbytopic.htm
- EUROSTAT statistics manuals by topic https://ec.europa.eu/eurostat/publications/manuals-and-guidelines
- World Wildlife Crime Report. Trafficking in protected species. UNODC (2020) https://www.unodc.org/documents/data-and-analysis/wildlife/2020/World_Wildlife_Report_2020_9July.pdf
- Wildlife Trade Research Methods by Daniel Bergin and Vincent Nijman. Cambridge University Press (2020). https://www.cambridge.org/core/books/evolution-ecology-and-conservation-of-lorises-and-pottos/wildlife-trade-research-methods/CDADBB04D52A4390CDEE4FEC9A7E317B
- Quantitative methods of identifying the key nodes in the illegal wildlife trade network by Nikkita Gunvant Patel, Chris Rorres, Damien Joly and Josh S. Brownstein. Proceedings of the National Academy of Sciences (2015) https://www.researchgate.net/publication/278794772_Quantitative_methods_of_identifying_the_key_nodes_in_the_illegal_wildlife_trade_network
- Tools and resources to combat illegal wildlife trade. World Bank (2018) https://pubdocs.worldbank.org/en/389851519769693304/24691-Wildlife-Law-Enforcement-002.pdf

Limitations

The review team encountered a number of challenges and limitations:

- **Impact of the COVID-19 global pandemic.** The review team was not able to meet virtually with TRAFFIC's former Elephant and Rhino Programme Leader and founder of ETIS Tom Milliken, until 48 days after the start of engagement due to travel restrictions and limited internet connectivity, although he did make himself available quite extensively thereafter, despite being in retirement, both virtually and through email correspondence when needed. A formal handover and onboarding of TRAFFIC's new Senior Analyst who started in June 2020 was also hampered by COVID-19. It was not possible due to COVID-19 health issues to engage with either Fiona M. Underwood or Robert W. Burn at any juncture during the review. As the main statisticians responsible for the formulation of the ETIS methodology, this is perhaps one of the main limitations and shortcomings of the review. As a result of the unavailability of TRAFFIC's former statistician, the Data Management and Statistical Analysis Specialist had to rely on the combined input of the TAG statisticians, TRAFFIC's Senior Analyst and its former Elephant and Rhino Programme Leader[2]. Notwithstanding the mitigation strategy, some gaps persisted, notably with understanding the cluster analysis as none of these individuals had run that portion of the code previously.

- **The review coincided with the release of ETIS Online.** The ETIS review ran in parallel to an extremely busy but important time for TRAFFIC as key staff members were preparing for both the soft launch and official release of ETIS Online in October 2020. Taken together, the considerable work

[2] "Despite the limitations referred to above, the availability of Tom Milliken, former ETIS Director, and Louisa Sangalakula, the TRAFFIC ETIS Programme Officer, assisted with information that was considered as part of the review".

to move ETIS to the web (including *inter alia* migration / digitization of data collection forms, translation work, coding, testing, bug fixes, collation of training materials etc.) at times impacted TRAFFIC's responsiveness to the consultants' requests for documentation, validation of artifacts and updated code.

- **Onboarding of new TRAFFIC staff without handover or shadowing.** With the recruitment of a Senior Analyst in May 2020, TRAFFIC has now brought the statistical capacity underpinning ETIS in-house. Unfortunately, a combination of factors resulted in the Analyst having to ramp up quickly and independently without a proper handover, without training or shadowing. This has been compounded with the busy timeframe in which she had to operate to understand the code, compile an ETIS report for the MIKE-ETIS TAG on 2 July 2020, oversee delivery of ETIS Online and support the ETIS review, as well as a myriad of personal challenges. The trade-off has been to prioritize certain aspects of the job at the expense of others. For example, the Senior Analyst reported that there was no time to analyze the cluster analysis-part of the methodology and hence could not be consulted on this dimension of the statistical model.

- **Issues encountered while running the code.** The Data Management and Statistical Specialist encountered a number of errors while running the code during the assessment of the statistical model. It is important to note that the same errors were experienced by a member of the TAG in January 2021, who subsequently adopted the solutions proposed by the Data Management and Statistical Specialist to overcome them.

The above are the major issues encountered that were discussed between the consultants and the CITES MIKE Coordinator and raised with the CITES Secretary-General as justification for revisiting and amending the ETIS review's timelines. Additional explanations and practical examples of the limitation encountered are reported in the Annex G.

Deviations

The following deviations from the Data Managements and Statistical analysis expert's ToR are noted:

- While the ToR is silent on the need for a review of the code, the Inception Report and a preceding briefing note prepared for the CITES MIKE Coordinator highlighted that an end-to-end review of the code would be time consuming. The Inception Report indicated that "*at the guidance of the MIKE-ETIS TAG statisticians and in view of the available time, the Data Management and Statistical Analysis Specialist will prioritize certain aspects of the code in their review*". Notwithstanding, additional requirements were introduced by the CITES Secretariat during the ETIS review to examine the entire code in order to replicate results from CoP18, which resulted in the production of an improved code free of errors that can be accessed here;

1. Data Collection

Statistical data collection is the operation of statistical data processing aimed at gathering statistical data and producing the input object data of a statistical survey[3]. Data collection is the process of collecting data in an established system with the objective of having an accurate picture of an area of interest. While methods vary by discipline, accurate data collection is a prerequisite to all fields of study which ensures the integrity of research, allows making informed decisions and enhances the quality of subsequent analysis. The goal for all data collection is to capture quality evidence that leads to the formulation of convincing and credible answers to the questions that have been posed.

1.1. Methods of Data Collection

Resolution Conf. 10.10 (Rev. CoP18) states that "All Parties should provide information on seizures and confiscations of ivory or other elephant specimens within 90 days of their occurrence." Early each year, the Secretariat issues a Notification on ETIS data collection calling on the Parties to submit previous years' seizure data to TRAFFIC or the Secretariat by March 31. Notifications include the updated data collection forms as well as explanatory notes to aid in data submission.

ETIS data are collected in 6 different ways, 4 of which concern data submitted by Parties while the remaining 2 are data collected without submission from Parties. Parties, also defined by TRAFFIC as one type of Data Providers (DPs[4]), have 4 options to submit their ETIS data. They can either compile one of the three ETIS forms or opt for sharing their non-ETIS pre-existing records.

To standardize data collection, Parties have been encouraged to use the 3 ETIS options that TRAFFIC makes available:

(i) ETIS data collection form (Word format),
(ii) ETIS Excel template, and
(iii) ETIS on-line data submission.

The three forms are identical in terms of questions asked, but with the ETIS Excel template it is possible to submit a number of different seizures in one submission, while with the ETIS Word form, Parties can complete details relating to individual seizures (each compiled form represents one seizure). The ETIS online data collection is the most recent tool launched by TRAFFIC and it allows submission of the data online on an interactive platform through the following website: https://etisonline.org/.

TRAFFIC also collects ETIS data through two additional sources:

(i) Information from other sources, for example: journals, newspapers, NGOs, TRAFFIC reports; and
(ii) World Custom Organization (WCO).

The 6 methods of data collection are classified by TRAFFIC as active and passive data collection efforts and further divided in 3 additional categories: (1) Targeted (2) Prompted and (3) Passive. Active data collection includes Targeted and Prompted modalities, which means that the data have been collected due to a direct intervention organized by TRAFFIC. Passive data collection, on the contrary, means data were submitted without any intervention or solicitation. All these elements and categories determine the Data Collection Score which is one of the two proxies used to determine the Reporting Rate[5].

[3] OECD Statistical definition of data collection https://stats.oecd.org/glossary/detail.asp?ID=2544
[4] Data Provider is a definition of a user type that hasn't been defined yet by TRAFFIC and may apply to non-Parties as well (e.g., WCO).
[5] An in-depth examination of these themes can be found in Chapters "Data interpretation" and "Review of overall ETIS methodology, technical outputs and reports".

Methods and classifications of ETIS data collection are further explained below. Note: the descriptions were taken from TRAFFIC's Standard Operating Procedure Manual and updated through consultation with TRAFFIC, where needed:

1) Data Collection Form

The "Elephant Trade Information System Data Collection Form" (in Word format) is used to submit individual records via the CITES Secretariat or directly to TRAFFIC. The form and its explanatory notes are shared with Parties on an annual basis through a Notification to the Parties published on the CITIES website by the CITES secretariat.

The form is accompanied by a document called "Explanatory Notes for the Data Collection Form" which helps in defining specific terms and explains how to provide data of high quality. The Data Collection Form and the Explanatory Notes can be downloaded from the ETIS website at etisonline.org. After logging in as DP, they are available in the DP home page under *Resources*, *Manual Form and Help Notes*. Explanatory notes are also available as an attachment to the Notification calling for data collection from the Parties (e.g., Notification No. 2021/011) published on the CITES website.

When a Data Collection Form is received electronically[6], TRAFFIC's System Administrator (SA) ensures that data quality and consistency are respected, and that the Minimum Required Information [7] are present so that a seizure can qualify for entry into the ETIS analysis. Data submitted without the Minimum Required Information do not qualify for inclusion in the ETIS analysis and therefore do not contribute to the subsequent Trends and Cluster analysis although they are retained in the ETIS database. The necessary follow up is made by TRAFFIC to at least obtain the Minimum Required Information. The ETIS Data Collection Form and the Explanatory Notes downloaded from the ETIS website that were considered for the purpose of this review can be accessed through Notification No 2020/005[8].

2) Standard Excel Template

The Standard Excel Template is another method available to DPs for submitting seizure records either directly to TRAFFIC through email or through the on-line system by uploading the file on etisonline.org. The usefulness of this method is that it allows submission of multiple elephant product seizures in one upload. Another advantage of this template is that it can be filled in off-line and uploaded to the database at the users' convenience. The Excel template can be downloaded from the ETIS website on the DP Home page under *Resources, Excel Template for Multiple Records and Help Notes*. When the template has been filled, the DP uploads the file under *Upload File of Seizure Records* on the DP home page. Parties can also submit the Excel template electronically via email to TRAFFIC or to the Secretariat. The SA ensures that all the required questions in the template have been filled appropriately so that data quality and consistency are assured. If incorrect data or errors[9] are reported, the users will receive an error log directing them to exact fields of each row that need revising, so that they can amend and resubmit the data using the Excel template file.

The Standard Excel Template downloaded from the ETIS website that was considered for the purpose of this review can be accessed through Notification No 2021/011 – Annex 3.

3) On-line Data Submission

This in a new method of data collection. The ETIS website now allows SA, DO and CITES Parties (Data Providers) to submit elephant seizure records using an on-line form. SA and DO submit seizures coming from

[6] TRAFFIC explains that, while in previous years post was used as well to receive data, currently ETIS exclusively receive data electronically and hopes78 that submission will eventually occur primarily on ETIS Online.
[7] The Minimum Required Information is the minimum information that a data provider should report relating to a seizure in order to be considered in the ETIS analysis i.e., the Trends Analysis and the Cluster Analysis.
[8] As explained above, the files can be downloaded from etisonline.org after logging in as a DP. It is important to be aware that what is written in this review is based on the version of the documents that were provided for the purpose of this review. This is particularly important because TRAFFIC will make changes to the version of the documents available during the review. It is essential to consider the right versions on which the considerations of this review have been built.
[9] More information about what is considered an "incorrect data" or "error" is provided in the chapter "Data Validation".

secondary data collected elsewhere (NGOs, newspaper, articles, etc). The on-line ETIS system is restricted under a password system due to the sensitivity of the information involved. Non-TRAFFIC users need to be approved by their country's Management Authority, therefore the ETIS database is not open to the general public. A guide that provides instructions on how to navigate ETIS online is available for DPs (after they log in) on the home page of ETIS online.

4) Parties' pre-existing records

Many countries have their own standardized documents or databases for tracking elephant and other wildlife seizures. In the Standard Operating Procedures (SOPs), TRAFFIC specifies that as long as the Minimum Required Information are reported, it is possible to accept information in any format, including electronic or printouts of pre-existing records. TRAFFIC reports that most of the information received via email is not in the standard ETIS format, and often in a format derived from the data collection system specific to the country. Most of the files received using this modality are sent as Excel workbooks attached to e-mails.

5) World Customs Organization (WCO)

TRAFFIC has a Memorandum of Agreement with the World Customs Organization to exchange data on elephant product seizures reported by customs authorities globally. The data exchange takes place when both organizations finalize their data collection for a given year.

6) Other sources

According to TRAFFIC, other sources of information are CITES reports, reports by TRAFFIC, NGOs working in conservation, newspapers, articles (both electronic and printed), TV, radio, specialized reports, the world-wide web (Google alert on 'ivory') and other journals. TRAFFIC reports that these sources rarely have sufficient information for ETIS analysis, and follow-up work is usually needed to ascertain and confirm the information. TRAFFIC describes in its SOPs that they scan these sources and attach them as a record in the ETIS database. These types of sources are not the major sources of ETIS data collection.

1.2. Minimum Required Information

There seems to be lack of clarity relating to the information that constitutes the Minimum Required Information (MRI) without which a seizure record cannot be included in the ETIS analysis. In other words, the Minimum Required Information are fundamental information that are flagged as compulsory in the ETIS forms. Despite their importance, the table below captures the different ways in which this set of data is reported in TRAFFIC's documents. When an X is present, it means that the information reported in the column was flagged as MRI in the corresponding document written in its row. Therefore, as shown in this table, different TRAFFIC's documents report different MRI.

		Description of how the Minimum Required Information is reported across different TRAFFIC's documents								
		Minimum Required Information								
		Internal Reference Code	Q1 Source of data	Q2 Date of seizure	Q3 Agencies responsible for the seizure	Q5 Location of discovery	Q11 Ivory type and quantity	Q12 Non-Ivory Elephant products	Q18 Nationality of suspect	Is Status Category[10] 3 or above?
TRAFFIC's documents	Explanatory notes of the ETIS Data Collection Form			X (year)		X (country)				
	ETIS Data Collection Form (Word format)		X	X (year)	X	X (country)	X (at least one either number of pieces	X (at least one either number of pieces or weight)		

[10] Status Category are explained in the chapter of Data Validation

							or weight)			
	ETIS Excel Template	X		X (year)		X (country)	X (whether these values are estimated or official)		X (it is a requirement to identify the country in which the seizure took place)[11]	
	ETIS Online Reporting			X (year)						
	TRAFFIC SOPs page 24		X	X	X	X[12]	X[13]	X		
	TRAFFIC SOPs pages 26 (Data Collection Form) and 35			X		X				
	TRAFFIC SOPs page 26 (Standard Excel Template)	X		X (year)		X	X (whether these values are estimated or official)	X (whether these values are estimated or official)		
	TRAFFIC publication "Notes on R scripts for CoP 18"			X (year)		X (country)	X (either weight or pieces – either raw or worked)			X
	TRAFFIC publication "Understanding ETIS"			X (year)	X	X (country)	X (either weight or pieces – either raw, semi-worked or worked)			

Based on the above table it is clear that the set of MRI is unclear as well as their definition and explaination. An example of confused definition is reported in the column Q11[14] where it is not clear if "at least one, either number of pieces or weight" or "whether these values are estimated or official" is the Minimum Required Information to be reported for the question number 11 "Ivory type and quantity".

Given the lack of clarity, and after consultations, TRAFFIC communicated that the Minimum Required Information are: (1) source of data, (2) date of seizure, (3) agency or authority responsible for the seizure, (4) location of discovery, (5) ivory type and quantity, (6) type and quantity of non-ivory products.

For the purpose of this review the MRI have specified and described in Annex B which reports the modification to "Annex 1 Resolution Conf. 10.10 (Rev. CoP18)". The modifications proposed by this review clarifies the MRI. For example, in the case of Q2 "Data of seizure" it is important to specify that at least the year of the seizure should be reported, therefore the day and the month are not essential information, and their absence will not prevent the seizure data to be included in the Trend and Cluster analysis.

1.3. Data Collection Score

Seizure data are submitted to TRAFFIC in different ways and TRAFFIC records the degree of effort spent to obtain the data, which is in other words, the Data Collection Score. In some cases, data are collected without any submission from countries, this is defined a "passive" data collection. In other cases, TRAFFIC defines the data collection as "active", this is when the data collection has to be targeted or prompted in order to collect

[11] In the ETIS Excel template, the field "Nationality of suspect(s)" is marked which three stars which in the footnotes reports "It is a requirement to identify the country in which the seizure took place". This is a mistake that should be corrected to guarantee better quality of ETIS data collection.
[12] In TRAFFIC SOPs page 24, this field is referred to as "location of seizure" instead of "location of discovery". It is important to keep the terminology consistent in the documents that describe the methods of data collection.
[13] In TRAFFIC SOPs page 24, this field is referred to as "either estimated number of pieces or weight by ivory type" instead of "Ivory type and quantity". It is important to keep the terminology consistent in all the documents that describe the methods of data collection.
[14] Q11 means question number 11. In the ETIS forms each question is classified with a number (Q1, Q2, Q3 etc.).

details on a specific incident. Passive and Active classifications are used to determine the Data Collection Score which is one of the two proxies used to calculate a country's Reporting Rate[15].

When assigning a Data Collection Score to each individual record, it is very important for the SA or DO to correctly classify the method used to acquire the data as this information will influence the Reporting Rate and hence the Trends and Cluster analysis.
More details pertaining to the three categories of Data Collection Score are:

- **Targeted**. Acquisition of data through TRAFFIC interventions involving active, direct primary data collection exercises.
- **Prompted**. Acquisition of data through TRAFFIC interventions before a CITES event, e.g., COPs and Standing Committees meetings, as well as through other contacts with government authorities e.g., African and Asian Elephant Range State meetings and trainings, persistent follow-up letters, calls on incomplete information and provision of ETIS country reports.
- **Passive**. Acquisition of data without any intervention or solicitation of Parties, e.g., NGOs working in conservation (including TRAFFIC), newspaper articles, and internet alerts on key subject matter.

At the moment, TRAFFIC's documents present different terms and definitions to describe each category of the Data Collection Score. Sometimes the Data Collection Score is referred to as Data Collection Effort. The following table shows the various terms used for the different categories in different TRAFFIC's documents. Indeed, TRAFFIC's documents talk about two additional categories "Routine" and "Automated" which are not actually used in the ETIS methodology. This creates confusion and needs to be corrected.

		Data Collection Efforts				
		Targeted	Passive	Prompted	Routine	Automated
TRAFFIC's documents	TRAFFIC SOPs manual page 37	X	X	X		
	TRAFFIC SOPs manual's various other pages	X	X	X	X	
	Underwood et al "Dissecting the Illegal Ivory Trade: An Analysis of Ivory Seizures Data"	X		X		X
	TRAFFIC publication "Understanding ETIS" Underwood	X	X	X		

1.4. ETIS Subsidiary Database

According to TRAFFIC, in addition to law enforcement effort, elephant seizures are greatly influenced by the efficiency in which law enforcement actions unfold. For this reason, TRAFFIC uses the ETIS Subsidiary Database[16](SD) to:

A) Bias-adjust the seizure data[17].

[15] According to the ETIS methodology the observed Reporting Rate is biased therefore it is re-estimated using two proxies the Data Collection Score and the CITES Reporting Rate. More details on this are discussed in Chapter 5 "Data Interpretation".
[16] The definition of Bias-Adjustment is explained in the Chapter "*Data Interpretation*".
[17] Both these concepts will be explained in chapter "*Data Interpretation*" and "*Review of overall ETIS methodology, technical outputs and reports".*

B) Provide context for interpretation of analyses results[18].

The ETIS Subsidiary Database has been developed over the years with data collected from:

(i) Several independent bodies.
(ii) ETIS-derived data.
(iii) CITES-reported data.[19]

One example of variable collected from independent bodies is the Corruption Perceptions Index (CPI) of Transparency International (more information can be found here). CPI tracks perceptions of corruption as seen by business people, risk analysts and the general public. The CPI has ranked selected countries since 1995 with scores ranging from 100 (highly clean) to 0 (highly corrupt) in an annual iterative process.

Other examples of variables collected from independent bodies are the World Bank (WB) governance indicators. The WB "Country's Rule of Law" was used in the report to CITES CoP16 as a proxy to calculate the Seizure Rate[20]. It measures "*perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.*"

In the latest ETIS analysis, for CITES CoP18, only ETIS-derived and CITES-reported data have been used as a proxy to estimate the Reporting and Seizure Rate. Subsidiary data collected from independent bodies were used (along with pertinent trade literature and reports) to interpret the results of the cluster analysis.

Examples of ETIS derived data are: One-year Lagged Law Enforcement Ratio, Trade Chain Index and Data Collection Score. An example of CITES-Reported data is the CITES Reporting Score. All these variables are explained in details in the Chapter: "Data interpretation and assumptions".

Apart from the variables provided above, a complete list of all the elements that form the Subsidiary Database is not available. The calculation of proxies and the role that the ETIS SD plays in the ETIS methodology are analyzed in depth in the Chapter: "Review of overall ETIS methodology, technical outputs and reports".

1.5. Recommendations

Regardless of the field of study or preference for a particular method, accurate data collection is essential to maintain the integrity of any research. The selection of appropriate data collection instruments and clearly delineated instructions for their correct use reduce the likelihood of errors. A formal data collection process is necessary as it ensures that the data gathered are both defined and accurate. This way, subsequent decisions based on arguments embodied in the findings are made using valid data.

Reliability of data rests largely on the work of collecting the data and performing the analysis consistently. If there are failures in these processes, reliability of analysis and estimates is directly affected, and measures should be put in place to prevent this. Keeping this in mind and after consultations with ETIS stakeholders, the following recommendations are made:

1.5.1 Although there is a relatively good understanding of the methods of data collection used by ETIS, additional communication and awareness raising seems to be required to ensure Parties are aware of:

1.5.1.1 The different methods of ETIS data collection they can benefit from, according to their needs and equipment. For example, if they want to communicate a number of seizures they can use the Excel template while with the Word format they can communicate only one seizure. If they

[18] An in-depth analysis on interpretation of analysis information can be found in chapter 5 and 6
[19] The concept of Seizure Rate will be explained in the chapters of "*Data Interpretation*" and "*Review of overall ETIS methodology, technical outputs and reports"*
[20] Reference is made to CoP16 report, paragraph 10.

have internet connection, they can use the ETIS online tool or they can compile the information in the Excel or Word format and upload the seizure information later when internet is available.

1.5.1.2 The Minimum Required Information required and their importance. Detailed description of each MRI is required and they should be consistent for every ETIS data collection method.

1.5.2 Only one official name should be used for the minimum set of data required without which the seizures reported cannot be included in the ETIS analysis. At present, TRAFFIC uses multiple terms to refer to these data. This review adopts and proposes that the term Minimum Required Information (MRI) be used consistently in all ETIS documents, forms, reports, etc. It is good practice to keep terminology consistent through all documents.

1.5.3 The Explanatory Notes of the Data Collection Form were analyzed and the following should be addressed:

1.5.3.1 The Explanatory Notes do not clarify that "required information" means that without these Minimum Required Information the seizure record can be retained in the ETIS database but cannot be included in the ETIS analysis. It is recommended to include this important information so that Parties area aware of it.

1.5.3.2 Terminology in the ETIS Collection Form and the Explanatory Notes must be aligned, as this is not the case at present, and all terms explained. This includes providing a definition of "seizure" and "confiscation".

1.5.3.3 It must be clarified in the Explanatory Notes that the seizures to be submitted includes both national (domestic) and international seizures. Some Parties indicated that they are not reporting seizures relating to domestic / national illegal trade because they believed that the ETIS program concerns only international seizure.

1.5.4 An Explanatory Notes file should be created as a separate worksheet within the Excel file dedicated to the Excel template and to number the Excel's questions equal to those of the ETIS Word format and the ETIS Online reporting system. The alignment between the three forms needs to be addressed.

1.5.5 A new field should be inserted in the three ETIS data collection forms to request Parties to indicate whether the seizure reported concerns national or international illegal trade. This additional information should be clearly specified as it is particularly valuable for the calculation of the Trade Chain Index[21].

1.5.6 TRAFFIC SOPs report that there are 8 different methods of data collections. This review has reduced them to 6 methods. The method called "Email and email attachments" was the same as the one described under "Non-standard Seizure Form", while the method "Ecomessages" which means that Parties can submit their data using a pre-compiled Ecomessage form has been abolished by TRAFFIC. Therefore, the number of methods of data collection is 6 rather than 8 and the SoP should be amended to reflect this change.

1.5.7 The information on nationality of suspects is not used in the ETIS analysis and it is not clear why this information is collected. The collection of this information can cause delays in data reporting because some Parties may not feel confident in sharing it. Some Parties have explained that when they make a seizure, they can communicate the relevant data right away because, in practically all instances, the seizure will be confirmed as illegal trade and hence be eligible for the ETIS database. But, when it comes to the nationalities of suspects, some Parties prefer to wait for the result of the legal process before disclosing this type on information. Some Parties have suggested removing questions that do not correspond to data used in the ETIS programme and its analysis.

[21] The Trade Chain Index is explained in Chapter "Review of overall ETIS methodology, technical outputs and reports".

1.5.8 Some Parties were not aware that ETIS data should be communicated within 90 days and not every 90 days or after 90 days. Some Parties expressed their concern about the fact that, waiting for 90 days before communicating the data can be too long, without knowing they can submit ETIS data as soon as they are available. This information should be better communicated.

1.5.9 During consultations, most Parties expressed their concerns about the use of unofficial data unless they are consulted. It is recommended that Parties be consulted before including any unofficial data in the ETIS dataset to confirm the correctness of the information collected. TRAFFIC indicated that with the advent of ETIS Online this procedure will be facilitated.

1.5.10 During consultation, some Parties recommended to include TWIX[22] and Ecomessage data as a source of information for ETIS. Given that Ecomessages and TWIX data contain the Minimum Required Information these forms should be accepted as a "Party pre-existing record" method of data collection. At the moment, this doesn't seem to be the case.

1.5.11 The ETIS Subsidiary Database is poorly described in TRAFFIC's SOPs. Additionally, its description is absent in any documents prepared for CITES Parties. It is not clear what the complete set of the variables contained in the database is, how the data are collected and to which purpose they are used in the ETIS analysis. During consultations, some Parties indicated that qualitative subsidiary data should not be part of the ETIS methodology and preference should be given to more quantitative and factual data. Given that Subsidiary Dataset does contain quantitative elements as well as qualitative variables, it is recommended to provide a better description of the ETIS subsidiary database, methods of data collection and the role that this database has had over the time in particular in relation to the various ETIS analysis. For example, in reports prepared prior to CoP18, certain proxies were used to estimate the Reporting and Seizure Rate while at CoP18 different proxies were used. This does not appear to be clear among CITES Parties and needs to be better communicated.

1.5.12 The entire Subsidiary Dataset accompanied by its metadata should be published on the ETIS Online system.

1.5.13 It is evident that there are different levels of understanding of the covariates (also called proxies) used in the methodology. Although a more in-depth analysis of covariates is covered in the Chapters "Data Interpretation" and "Review of overall ETIS methodology, technical outputs and reports", it is important to note that the Data Collection Score is used as a Bias Adjusting Factor and is one of two proxies that determines the ETIS Reporting Rate. For this reason, it is recommended that clarity should be provided about the methods of data collection and the implications for the calculation of the Data Collection Score. Both, smart visual schematics, and detailed information on data collection scoring methods should be made available to CITES Parties. At the moment, a description of each Data Collection Score is missing and the available information is confusing. Descriptions for each category of the Data Collection Score must be clarified and consistent names for each category adopted. The following schematic table, prepared for the purpose of this review, can assist to improve understanding of the differences among the 6 methods of data collection and how the Data Collection Score is assigned according to the data collection method:

Methods of data collection and their classification according to the ETIS methodology

[22] Trade in Wildlife Information eXchange (TWIX) is a database managed by TRAFFIC on wildlife information exchange. There is not just one TWIX but there are three in operation: EU-TWIX covering EU + a few other countries https://www.eu-twix.org/; AFRICA-TWIX covering COMIFAC region https://www.africa-twix.org/; and SADC-TWIX covering the SADC region https://www.sadc-twix.org/. The data at the core (i.e., Minimum Required Information) of TWIX and ETIS are very similar. TWIXes are online tools developed to facilitate information exchange and international co-operation. The TWIX online platforms are an online tool available to enforcement and management officials responsible for the implementation of international wildlife trade and CITES regulations, helping connect officials across borders and allow them to rapidly share information and expertise.

Data provided by Parties		Data not provided by Parties
Data submitted by Parties compiling the ETIS forms	**Data submitted by Parties without compiling ETIS forms**	**Data collected without any direct submission from Parties**
1) Data Collection Form (Word form)	4) Parties' pre-existing records	5) Other sources
2) Standard Excel Template		6) World Custom Organization[23]
3) Online data submission		
Data Collection Score: 1. Targeted 2. Prompted 3. Passive		
Active		Passive
1.Targeted or 2. Prompted	1.Targeted or 2. Prompted	3. Passive

1.5.14 More time and resources should be invested to communicate the importance of data collection. It should be clear to all ETIS stakeholders that high quality is fundamental to produce good quality analysis, given that, unobservable seizures are estimated based on collected (observable) data. At the same time, Parties should make an effort to communicate their data more frequently and more precisely. Failure do so may seriously undermine the quality of trend and cluster analysis

[23] TRAFFIC in their SOPs manual reports that WCO is currently undertaking a review of their information sharing agreements and no data exchanges are currently taking place.

2. Data validation

Data validation is a decision procedure ending with the acceptance or refusal of data. The decision procedure is generally based on rules expressing the acceptable combinations of values. Rules are applied to data. If data satisfy the rules, which means that the combination expressed by the rules is not violated, data are considered valid for the final use they are intended for[24].

2.1 ETIS data validation rules

TRAFFIC established six rules for validating ETIS data and checking their minimum standards. After completion of the data validation process, only validated data are part of the ETIS analysis. The following are TRAFFIC's validation rules:

1. The first validation check is the Reliability of the Source Score: Sources are scored as *A, B* and *C* with the most reliable source scored as *A* and the least reliable scored as *C*.
2. The second check is the Data Completeness Score: A score of 1 to 4 is allocated according to how complete the information received is, with a score of 1 indicating the data is generally complete, while a score of 4 indicates the data is incomplete.
3. The third check combines the two previous scores and ranges from *A1* to *C4* where A1 is the best score and C4 the worst.
4. The fourth check is called Status Categories and consists of 11 values ranging from -5 to +5 where only values of 3, 4 and 5 are accepted and included in the ETIS analysis.
5. The fifth parameter consists of automated checks carried out while uploading the data into the ETIS system. These checks are automated and visible to all DPs.
6. The sixth and last check consists of 19 pre-programmed data checks executed in R[25]. They are available only to the *TRAFFIC Administrator* on the ETIS website.

Additional details relating to data validation checks are provided below. Note: The information are extracted from the TRAFFIC SOPs Manual.

1) Reliability of the Source Score

Each seizure entry is assessed for data quality through a process that scores the reliability of source and the completeness of data. "Reliability of source", assesses the credibility of the data and is graded as follows:

A. *Highest degree of reliability*. This involves official source such as a government agency responsible for the seizure, a CITES Management Authority, INTERPOL or Custom authorities.

B. *Reliable*. This involves unofficial sources e.g., a reputable NGO, including TRAFFIC, an organization working in a protected area, or a known government official in an individual capacity.

C. *Least degree of reliability*. Examples of this degree of reliability are newspapers, magazines or websites, an unknown individual.

2) Data Completeness Score

The "Completeness of Data" is a measure of how thoroughly the ETIS forms have been completed. TRAFFIC grades completeness from 1 to 4 as follows:

[24] Definition of EUROSTAT 2018 "Methodology for data validation" https://ec.europa.eu/eurostat/ramon/statmanuals/files/methodology_for_data_validation_v2_0_rev2018.pdf
[25] R is a language and environment for statistical computing and graphics.

1. Generally complete information. These are all characteristics of 2 and 3 Status Categories[26] (which are explained in section **4)** below), plus most other fields of the data collection are addressed.

2. All the important case information is available, including everything in Status Category 3, plus actual information on both the number of pieces and weight by ivory type or other product.

3. Only Minimum Required Information is provided: source of data [Q.1]; date of seizure [Q.2]; agency responsible for seizure [Q.3]; location of seizure [Q.5]; ivory type and quantity [Q.11]; non ivory products type and quantity [Q.12]).

4. Less information than in any of the above three categories.

3) Combination of Reliability and Data Completeness Scores

This step combines the two previous scores and includes scores A1 to C4, where A1 is the best score and C4 the weakest.

A4, B4 and C4 are cases that usually remain pending as, in most instances, it is not possible to assess whether they represent a duplication without obtaining further information. TRAFFIC engages individual countries to try and verify such cases, but after failing to obtain further information following repeated attempts, these cases may eventually be rendered as a Status Category -2 which indicates Rejection. The resulting 3 × 4 matrix represents the combination of the two scores:

		DATA COMPLETENESS			
SOURCE RELIABILITY		1	2	3	4
	A	A1	A2	A3	A4
	B	B1	B2	B3	B4
	C	C1	C2	C3	C4

On this scale, a grade of A1 represents the highest grade in terms of reliability and completeness of data, while a score of C3 represents the minimum grade for validating a seizure case and including it into ETIS analysis. A4, B4 and C4 are excluded from the analysis.

4) Status categories

Each status category describes how the data have been treated and classified by TRAFFIC staff in the ETIS database.

According to TRAFFIC SOPs, there are 11 status categories from -5 to +5 that are used to classify ETIS data. Although all data are retained in the ETIS database, only data with status categories 3, 4 and 5 are part of the ETIS analysis.

Most of the status 5 records are associated with a source grade A as these records are submitted by Parties or government officials and generally, TRAFFIC does not need to seek further information.

TRAFFIC puts an emphasis on Status Categories 3, 4 and 5 as only the seizure records that fall within them can be included in the ETIS data analysis for CoPs and Standing Committee meetings. A data point can move between these categories as more information is added or removed. Most of the categories seem 'temporary' per definition and mostly relevant for internal TRAFFIC purposes.

[26] Here TRAFFIC refers to Status Categories 2 and 3 which are explained in point 4.

Record Status	Record Status Label	Status Description
-5	**Deleted**	A record has been deleted by the DP (rather than DO or SA) after it was newly created but before final submission to ETIS Online. This differentiates it from records deleted by the DO or SA denoted by status -2.
-4	**Manual Data Entry Seizure**	A new record that was uploaded by the DP using the online form. The record must be reviewed by the DP before making a final submission to ETIS.
-3	**Uploaded**	A new record that was uploaded by the DP using the Excel data template. The record must be reviewed by the DP before making a final submission to ETIS.
-2	**Rejected**	A record has been rejected by the DO or SA for reasons other than being a duplicate (e.g., ivory turns out to be mammoth; alleged incident never occurred, etc.).
-1	**Duplicate**	A record is a duplicate and, where appropriate, the information contained has been integrated into another record.
0	**Follow-up**	New information has been generated by a DP for an existing validated record, but has not yet been assessed by the DO (data operator) or SA (system administrator) and integrated into the existing record.
1	**Fresh**	A new record has been freshly created and submitted to ETIS by the DP. The record is pending, meaning that it has not been assessed by a DO or SA, still allowing the DP to suggest amendments to the record.
2	**Updated/ Not yet validated**	A new or existing record has been reviewed and edited by DO, but not yet validated by SA; OR a new record created by DO with information not from a DP and not yet validated by SA; OR a new or existing record created, reviewed or edited by a SA but not yet validated because minimum standard information is lacking (generally details concerning quantity).
3	**DO edited pending SA approval**	A validated record has been worked on further by a DO and needs to be approved by SA.
4	**Validated/Seeking further information**	A record has been validated for inclusion in the database, but SA is still actively seeking further information.
5	**Validated/Not seeking further information**	A record has been validated by SA and no further information is being actively sought.

5) Automated checks when inserting data into the ETIS online system

These types of checks are carried out while uploading the data into the system and are visible to DPs. Examples are: 'Date of seizure' cannot be later than 'Date of Report to ETIS'; 'Country of discovery' cannot be blank; Seizure year cannot be blank; etc.

6) 19 pre-programmed data checks

After having classified the data according to the procedures explained above, TRAFFIC performs some additional checks to flag inconsistencies within the data captured: 19 pre-programmed data checks are carried out in the R scripts. The scripts are available only to the Administrator on the ETIS online website under *Administrator permissions*. The results of the checks are downloadable to Excel. The 19 pre-programmed checks are the following:

Check#1	Country of Origin (raw) given, but no raw ivory quantities
Check#2	Country of Origin (worked) given, but no worked ivory quantities
Check#3	Country of Origin (raw) not a range state

Check#4	Transit Country same as Country of Origin, Export or Destination
Check#5	Country of Export same as Country of Destination
Check#6	Activity is "Illegal Killing" but Country of Origin (raw) not given
Check#7	Activity is "Illegal Killing" but no raw ivory quantities given
Check#8	Activity is "Export" but no Country of Export given
Check#9	Activity is "Transit" but no Country of Transit given
Check#10	Activity is "Import" but no Country of Destination given
Check#11	Country of Origin given and is a range state, but not same as Country of Origin (raw)
Check#12	Species does not agree with continent of Country of Origin (raw)
Check#13	Seizures with multiple Countries of Origin (raw)
Check#14	Seizures with multiple Countries of Origin (worked)
Check#15	Seizures with multiple Countries of Export
Check#16	Seizures with multiple Countries of Transit
Check#17	Seizures with weight (raw or worked) 500kg or more
Check#18	Seizures of 100kg or more with weight (raw or worked) a round number
Check#19	Seizures of worked ivory where Country of Origin is different from Countries of Origin (worked)

2.2 Recommendations

A clearly defined communication structure is required to support a good data validation system. Uncertainty about the flow of information is problematic because a poorly organized communication structure leads to inadequate monitoring and validation thereby limiting the opportunities to detect errors. Validation is part of the process to identify actions necessary to correct faulty data collection practices and minimizing such future occurrences. A team is more likely to not realize the necessity to perform these actions if their procedures are written vaguely and are not based on feedback or capacity building. For these reasons, the following recommendations are proposed:

2.2.1 The reliability of data with Source Score Grade C (“Least degree of reliability”) should be verified through consultation with relevant Parties. With the launch of ETIS Online, data will be available for Parties to validate records and suggest amendments hence this recommendation may be implemented in the near future.

2.2.2 The description of the “Reliability of the Source” scores should be enriched. For example, for the score B, what are the criteria to define an NGO to be “reputable”? Are government officials allowed to share government information in a personal or individual capacity? For the source of grade C, what TRAFFIC means by “unknown individual”?

2.2.3 It is recommended to clarify how grades A, B and C are assigned. At the moment the description provided is too short and does not clearly describe the process.

2.2.4 The "Data Completeness Score" gives a grade of 3 to the data collected when a seizure has the "Minimum Required Information". As noted in the previous Chapter, the definition of each MRI is not yet clear, and should be clarified. As a consequence of the lack of clarity, the grade 3 and how it is assigned remains unclear.

2.2.5 The combination of "Reliability of the Source Score" and "Data Completeness Score" is described in the TRAFFIC SOPs manual with a 3x4 matrix. It is recommended that a slightly revised version of the matrix, as reflected below be adopted to clarify what combination of data is included in the analysis. In the matrix below, any seizure that scores in a red cell is not to be used in the ETIS analysis. On the contrary, all seizures that are classified as green will be used in the ETIS analysis. It is recommended to use this matrix because cells' colors make the scores more intuitive for non-technical people. Green cells are accepted, and red cells rejected.

		DATA COMPLETENESS			
SOURCE RELIABILITY		1	2	3	4
	A	A1	A2	A3	A4
	B	B1	B2	B3	B4
	C	C1	C2	C3	C4

2.2.6 After consultation with TRAFFIC, it was noted that the "Status Categories" reported in the SOPs manual are not updated. It is recommended that TRAFFIC updates the Status Categories and the description of the new three categories -5, -4 and -3 in the SOPs manual.

2.2.7 The R script published on GitHub[27] called "*sz id remove weights pieces model.R*", in its introductory notes, reports that some of the collected seizures need to be removed from the analysis. The reasons vary and are reflected in the footnote below[28]. After reading these notes, it is clear that the data validation procedures need to be strengthened as some data points (seizures) need additional information. If the validation rules were fully implemented, as described above, then the errors described in the script would not have been reported. For example, most of the notes indicate that there is no solid information on both the number of ivory pieces and their weights. Sometimes it is not clear if pieces are raw or worked. These notes conflict with the Minimum Required Information and with the checks performed by TRAFFIC. Additionally, it is recommended that TRAFFIC analysts have to ensure that all Minimum Required Information is collected during the data collection phase, otherwise detecting missing information during the analysis phase makes the retrieval of information much more difficult and time consuming.

2.2.8 Validation rules should be clearly delineated for each statistical phase of the ETIS program. The documentation of the validation rules should be improved, and they should assign clear responsibilities to the individuals involved in the ETIS data validation process.

[27] https://github.com/fmunderwood/ETIS_CITESReporting_RCode

[28] List of reasons why seizure records need to be removed from the analysis:
"109137[28], # weight needs to be changed but also doesn't have pieces anyway
101114, # calculate worked from model and estimate rest as raw
111934, # Number of pieces seems too small for weight - agree
23770, # Need to check whether it should be worked rather than raw - given weight is so small
28668, # Need to check whether it should be worked rather than raw - given weight is so small
107677, # Weight is only given for one piece although quoted as if for 71
31881 # Noted as raw and worked but only weights and pieces given for raw".

2.2.9 Consistency checks should be carried out for similar concepts or concepts that are the same. This involves first making an inventory across domains of similar concepts or concepts that are same and checking differences in values collected between these concepts. If values are different, these differences should then be either justified or corrected. TRAFFIC should consider validating consistency of ETIS data across different databases.

- Internal database: TWIX data collected by TRAFFIC on the same subject could, for example, help in detecting/augmenting ETIS missing information.
- External database: Ecomessage data, World Custom data, MIKE data, UNEP annual illegal trade data, stockpile data, ivory price data, datasets held by the IUCN/SSC African Elephant Specialist Group's African Elephant Database (elephant numbers) etc. should be used for checking consistency and filling the gap of ETIS data.

2.2.10 A detailed description of how the ETIS Subsidiary Database is validated should be provided. The rules explained above are applied to ETIS data only and it is not clear what are the validation rules applied to the Subsidiary Database.

3. Data management

Data management plans are a key element of good data management. A data management plan should describe the data management life cycle for collection, procession, and publication of data[29].

While the previous two chapters covered the Data Collection and the Data Validation parts of the data management process, this chapter will cover specific aspects of ETIS data management such as: the TRAFFIC management structure, MIKE-ETIS Technical Advisory Group (TAG) functions, ETIS database and Subsidiary Database management and software management.

3.1 ETIS data management

The Resolution on "*Trade in elephant specimens"* adopted at the 10th meeting of the Conference of Parties (Resolution Conf. 10.10 Harare, 1997) recognized TRAFFIC's Bad Ivory Database System (BIDS)[30]. BIDS was established in 1992. The CoP furthermore recognized that BIDS has been useful in assessing ivory trade developments since its seventh meeting (Lausanne, 1989) and that although further development and improvement were necessary, BIDS was designated as the appropriate instrument for monitoring the pattern and measuring the scale of illegal trade in ivory and other elephant specimens. In order to meet the requirements of the CITES Parties, BIDS evolved into ETIS. The design of ETIS was initially outlined in document SC40.5.2.6, which was considered at the 40th meeting of the Standing Committee to CITES and it was recommended that TRAFFIC should continue developing the ETIS database and a system for gathering relevant information (SC40 summary report).

TRAFFIC describes the ETIS data management in its Standard Operating Procedures (SOPs) manual[31] developed as part of the Darwin Initiative grant with the University of Reading. One of the key objectives of this project was to "*address long-term sustainability issues associated with the Elephant Trade Information System (ETIS) to ensure its operational integrity beyond its current dependency on a small core of individuals who have been intimately associated with its development and management since its inception*." The development of the first ETIS SOPs Manual represented a major step in the process of consolidating and detailing the operational functions, procedures, requirements and definitions that underpin the management and analysis of the ETIS data.

3.1.1 TRAFFIC management structure

Since its inception and through the many iterations of Resolution Conf 10.10, the CITES Parties have mandated that ETIS be "*managed and coordinated by TRAFFIC in consultation with the MIKE-ETIS TAG and in collaboration with the CITES Secretariat*". TRAFFIC started to manage ETIS in January 2000 and the operational base was in Harare, Zimbabwe. In January 2020 it moved its operational base to Pretoria, South Africa while the ETIS software is located in Cambridge, United Kingdom.

The core ETIS team of TRAFFIC consists of the Senior Analyst and the Programme Officer. They both have the functions of System Administrator as described in the following responsibilities[32]:

- *Senior Analyst:* The Senior Analyst provides overall direction for the daily operation, management and analysis of ETIS and is the principal interface with CITES on ETIS matters. Specific activities include line management responsibilities over the Programme Officer; preparing ETIS data, conducting modeling analyses and summarizing results in ETIS reports; delivery and presentation of all ETIS analyses and reports to the CITES Standing Committee, Conferences of the Parties and other related fora; attendance at

[29] European Commission definition https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/data-management_en.htm#:~:text=Data%20Management%20Plan%20%E2%80%93%20general%20definition&text=As%20part%20of%20making%20research,the%20end%20of%20the%20project&text=whether%20data%20will%20be%20shared%2Fmade%20open%20access%20and

[30] Bad Ivory Database System (BIDS) that TRAFFIC developed in 1992 to track ivory trade dynamics in the post-CITES ban period

[31] TRAFFIC SOPs manual, page 7, preface section.

[32] Description of responsibilities in taken from TRAFFIC SOPs Manual.

MIKE-ETIS Subgroup meetings of the CITES Standing Committee; organizing, coordinating and chairing periodic meetings of the MIKE-ETIS TAG (Technical Advisory Group); coordinating model development with MIKE-ETIS TAG expert statisticians; coordinating and managing all aspects of ETIS Online including web development by consultants and development and delivery of training materials to the CITES Secretariat and the Parties; liaison with the CITES Secretariat, the CITES Parties, the MIKE programme and other related bodies concerning ETIS and ivory trade issues; fundraising and management of the financial resources of ETIS; and producing concepts and proposal to support the financial operation of ETIS. The Senior Analyst has System Administrator roles on ETIS Online and manages timely aspects of the system (e.g., user registration) in the absence of the ETIS Programme Officer.

- *Programme Officer:* The Programme Officer is the principal manager of the ETIS data, including data collection, verification and entry into the database; line management responsibilities over the Data Operator; ensuring implementation of all security measures for the system; dealing with all information requests in an appropriate manner; generating weekly country reports for the CITES Parties on ETIS Online; managing and coordinating all ETIS Online user registration including verifications with CITES Management Authorities and communications with the CITES Secretariat; developing and managing all of the subsidiary databases of ETIS and conducting ETIS data checks; assisting with the production of analytical reports for the Conference of the Parties; co-coordinating all aspects of ETIS Online web development, and the development and delivery of ETIS Online training with the Parties; assisting in communications associated with ETIS in general and specific outputs in particular; helping to manage ETIS finances; organizing and assuming secretarial functions for meetings of the ETIS TAG; and assisting with the production of concepts, proposals and other reports as appropriate to donors for the operation of ETIS. The programme officer is the main ETIS Online System Administrator.

- *Data Operator:* The Data Operator is managed by the System Administrator to assist with the operation of ETIS, including data collection, verification and entry into the database; producing routine outputs of ETIS, such as ETIS Country Reports for the CITES Parties; assisting with the management of the subsidiary databases of ETIS; and other functions as required. For the time being, this position is not filled, and the Programme Officer is carrying out this role.

3.1.2 MIKE-ETIS TAG functions

Resolution Conf. 10.10 (Res. CoP18) provides that "*technical oversight will be provided to both MIKE and ETIS through an independent technical advisory group to be established by the Secretariat*". Annex 1 of the Resolution also states: "*The MIKE and ETIS Technical Advisory Group (TAG) support the development and implementation of ETIS. ETIS will be managed and coordinated by TRAFFIC in consultation with the TAG.*" The Term of Reference of MIKE-ETIS TAG can be accessed here.

3.1.3 ETIS database management

The ETIS database is currently managed by TRAFFIC's System Administrator (SA), with a scope of having one or more Data Operators (DO) in future to assist. The administrator and operator are internal users of the ETIS database and collect unofficial information from media report, press articles, the internet, etc. for ETIS purposes. The DO performs data entry with limited editing functions whereas the SA has system management and administrative functions that include, uploading data using the standard Excel template, registering data providers, and manual data entry. Database management is outsourced, first by Vulcan labs and then by S-Branch.

3.1.4 Subsidiary Database management

Unlike the ETIS database, which has a fixed structure in terms of tables and fields, the ETIS Subsidiary Database has a facility for the user (i.e., the System Administrator and the Data Operator)[33] to add or remove variables, so that new subsidiary data can be accommodated at any time without needing to re-design the database structure. ETIS may have had multiple databases (DBs) early on when the DBs were developed in

[33] TRAFFIC SOPs manual page 49

'MS Access'. However, the current version of ETIS is consolidated into a single DB, developed with R and PostgreSQL DBMS (Database Management System). Subsidiary data, as well as seizure data, are stored in tables within this DB.

3.1.5 Software management

The ETIS server is located in a datacenter in Cambridge, while the backups of the server are stored in a London datacenter – this is the disaster recovery solution. TRAFFIC has recently shifted the support for this to a new development company, S-Branch, which has been conducting database security checks to ensure high level of security. S-Branch have been assisting TRAFFIC with additional functionalities of ETIS Online. Regular database back-ups are also implemented.

3.1.6 Management of ETIS database before performing ETIS analysis

A local copy of the ETIS database needs to be created in order to be used to perform the ETIS analysis (trend analysis and cluster analysis[34]). The R statistical software is used to analyze the data and, the results are reported to the relevant CITES meetings. Access to the local copy of the database is managed using the R package[35] and PostgreSQL together with the scripts stored on GitHub called "*PG settings.R"*.

All R scripts are managed and stored using GitHub.

The Programme Officer and the Senior Analyst both have administrator roles on the ETIS website, hence they both can select the menus on ETIS Online to generate the data for the analysis. However, the Programme Officer is the primary and essential person to verify all seizure data, collate subsidiary data, and run data checks on the database before a bench-marked copy is ready to be exported. Once the Programme Officer completes these preparation steps, both the Senior Analyst and the Programme Officer can generate and export a *sql* file for the analysis. At this point the ETIS analysis are carried out and are the sole responsibility of the Senior Analyst.

3.2 Recommendations

A data management system is not simply a database, as oftentimes is assumed, rather it is the integration of software, hardware, workflows, and the culture that is created around data management in an organization. The following five recommendations provide a foundation for building a strong, cohesive ETIS data management system if combined with a robust, scalable database software package.

3.2.1 A clearly defined data management plan should be established. A data management plan defines the types of data that exist and how they are stored and secured. It also outlines the best practice workflows and quality assurance procedures. A data management plan describes the generalized outputs or data uses and how the documentation associated with the entire system is managed. Explanations are provided in TRAFFIC SOPs Manual but are out of date and disorganized hence it is recommended to revise them.

3.2.2 A data lifecycle control should be implemented. Assessing the lifecycle of data could result in actions to strengthen the storage, validation, and management of appropriate data and guidance on when to archive or delete data.

3.2.3 Identify data owners and data stewards to ensure that the right people are assigned to the right roles within data management system. It integrates data management teams with subject matter experts to ensure that data integrity and quality is maintained while also making smart decisions about what information needs to be captured. This includes having an up do date list of focal points of CITES

[34] ETIS Trends analysis and Cluster analysis are explained in Chapter 6.

[35] R packages are extensions to the R statistical programming language. R packages contain code, data, and documentation in a standardized collection format that can be installed by users of R, typically via a centralized software repository such as CRAN (the Comprehensive R Archive Network).

Management Authorities for the ETIS data and ensuring full access by the CITES Secretariat to the ETIS database as, at the moment, this is not the case and access to ETIS is regulated by TRAFFIC only.

3.2.4 Security protocols in place should be better described. The SOPs should have a dedicated chapter on this matter explaining the procedure in place. To increase security, back-ups of ETIS databases should also be secured at the CITES Secretariat as this is not the case at present. This recommendation was suggested by some Parties as well.

3.2.5 Proper documentation and tracking should be ensured as this is lacking in the current SOPs manual. Sound data management includes documenting workflows and tracking anomalies. The documentation and tracking are useful to describe how the whole system works and to provide key insights for improvements moving forward.

4. Data analysis (R-code and algorithm used for analysis)

Data analysis is the process of transforming raw data into usable information, often presented in the form of a published analytical article, in order to add value to the statistical output[36]. The analysis of statistical data can be done with the help of different statistical software, the one chosen for the ETIS analysis is R.

R is a free software environment for statistical computing and graphics. It runs on a wide variety of platforms. R provides a wide variety of statistical (linear and nonlinear modelling, classical statistical tests, time-series analysis, classification, clustering, etc.) and graphical techniques[37].

4.1 ETIS Data Analysis

At the 69th meeting of the Standing Committee (SC69, Geneva, December 2017) (SC69 SR) the Standing Committee requested TRAFFIC to:

"*Make available the programming code in the ETIS analysis through a repository hosting service, together with appropriate annotations and supporting documentation. This will be augmented with links to existing documents explaining the methods used in the analyses.*"

The ETIS programming code used for the ETIS analysis of the 18th meeting of the Conference of the Parties (CoP18) was made available to CITES Parties, through a Notification to the Parties on 17 August 2019 (Notification No. 2019/046). This was the first time that the analytical code for a CoP ETIS analysis was published in the public domain. The code can be found in this GitHub repository. A document that contains a set of notes accompanying the R scripts is also included in the same GitHub repository.

As reported by the authors of the code [38], the purpose of the accompanying notes is to describe the process by which the R scripts are used to produce outputs for reporting to CITES and it is not to present the ETIS methodology as familiarity with it is assumed. However, the notes clarify that to fully understand the code it is necessary to be aware that some revisions to the methodology, which was published in 2013, have occurred. The modifications are reported to be "generally documented" in the relevant reports to meeting of the CITES Standing Committee and CoP and in CITES Information Documents. A brief summary of the latest revisions to the ETIS methodology is also given in the Notes on the GitHub repository, which are:

- The model to estimate seizure weights from number of pieces no longer includes a time trends (change first included in analysis for SC66 Doc.47.1 https://cites.org/sites/default/files/eng/com/sc/66/E-SC66-47-01.pdf.)
- The model to estimate the weight per seizure (for raw or worked ivory) no longer includes a time trends (CoP17 Doc. 57.6 Rev. 1 https://cites.org/sites/default/files/eng/cop/17/WorkingDocs/E-CoP17-57-06-R1.pdf.)
- Revised criterion to select the countries to include in the analysis (CoP17 Doc. 57.6 Rev. 1 https://cites.org/sites/default/files/eng/cop/17/WorkingDocs/E-CoP17-57-06-R1.pdf.)
- Derivation of a new variable – the Trade Chain Index – for consideration as a proxy variable for the seizure rate (CoP18 Doc.69.3 Rev.1 https://cites.org/sites/default/files/eng/cop/18/doc/E-CoP18-069-03-R1.pdf)
- Five rather than six ivory classes are used to model the Transaction Index (CoP17 Doc. 57.6 Rev. 1 https://cites.org/sites/default/files/eng/cop/17/WorkingDocs/E-CoP17-57-06-R1.pdf.)
- Accounting for multiple countries of origin (CoP17 Doc. 57.6 Rev. 1 https://cites.org/sites/default/files/eng/cop/17/WorkingDocs/E-CoP17-57-06-R1.pdf.)
- A revised set of variables for use in the cluster analysis (CoP18 Doc.69.3 Rev.1 https://cites.org/sites/default/files/eng/cop/18/doc/E-CoP18-069-03-R1.pdf)

[36] OECD Glossary for statistical terms https://stats.oecd.org/glossary/detail.asp?ID=2973

[37] The R project for statistical computing https://www.r-project.org/

[38] The code was developed by Dr. Robert W. Burn and Dr. Fiona M. Underwood.

- Development of a methodology to explore the robustness of the cluster analysis (CoP18 Doc.69.3 Rev.1 https://cites.org/sites/default/files/eng/cop/18/doc/E-CoP18-069-03-R1.pdf)
- Bayesian modelling is carried out using JAGS rather than WinBUGS (CoP17 Doc. 57.6 Rev. 1 https://cites.org/sites/default/files/eng/cop/17/WorkingDocs/E-CoP17-57-06-R1.pdf.)

The code to analyze the ETIS data is contained in 39 separate R scripts. These were originally developed under the Darwin Initiative project in collaboration with the University of Reading over the period 2009 – 2013. Since then, the ETIS analysis have been revised and the R code has been adapted over time. The set of R scripts published on GithHub constitutes the R code used to transform the ETIS data into the outputs for the CoP18 report.

4.2 Running the ETIS R Code for the purpose of this review

For the purpose of this review the scripts published on GitHub have been run with the help of the Notes file published on GitHub and the TRAFFIC SOPs Manual. The sequence / order in which the scripts should be run can be difficult to follow, and the statistician responsible for this review in collaboration with TRAFFIC Senior Analyst compiled an easy-to-follow step-by-step list where the scripts are numbered one after another. This facilitates the interpretation of both the ETIS methodology and the R code. The following list shows the order in which the scripts must be executed[39]. It also takes note of missing files which are mentioned in the methodology but are not present in GitHub.

1. PG settings.R
2. Sz data setup.R (run twice with 2007-2017 and 1900-2100)
3. Sz id remove weight pieces model.R
4. Wgt est models development.R
5. Wgt est models.R (calls functions in the file sz id remove weight pieces model.R)
6. Wgt est models comparison.R (calls functions in the file sz id remove weight pieces model.R) (missing from GitHub)
7. Sz id weights changed.R
8. Wgt est.R (calls functions in the file sz id weights changed.R)
9. Sz_inout_tables_df_gps_transit.R
10. Sz datasets_ALL gps.R
11. Get subsid vars.R
12. Covar setup.R (calls functions in the script “get subsid vars.R”)
13. SQL Select countries OETD.R
14. Trade route calculations.R (calls functions in the file SQL Select countries OETD.R)
15. Ggplot theme.R
16. Checking covariates.R (This file compares records used in 2017 Standing committee analysis. File with past covariates – “covars_ddmmyyyy.csv” was not provided)
17. Checking seizure records (This file compares records used in 2017 Standing committee analysis. File 2007-2016 szs_ALL_ddmmyyyy.csv was not provided)
18. Select final data.R
19. Rthat functions.R
20. Sz_JAGSul_model Final.R (Calls functions of the script “Rhat functions.R”)
21. df ctry add fn.R
22. Posterior distribution for lambda theta phi.R
23. Transaction index and plot.R
24. Sz model checkin.R
25. Raw wt dist jags.R
26. Wkd wt dist jags.R
27. Simulating raw weights.r
28. Simulating worked weights.r
29. Weights index and plots.R
30. Covar setup ALL cluster.R

[39] Please note that the list reports 39 scripts while the description says that the R scripts are 38. This is because one script “Wgt est models comparison.R” is currently missing from GitHub.

31. Trade route calculation ALL.R
32. Select Covars Cluster ALL.R
33. Sz x rep rate for all countries for cluster analysis Final.R
34. sz inout tables adj sims.R
35. df quantities RIE separate.R
36. mult ctries.R
37. Multiple mentions all wtlimit sims.R
38. Creating variables for cluster analysis sims Final.R
39. Cluster analysis sims Final.R

Parties have access to the R code scripts, but not to the seizure-database that is required to execute the R scripts. This is due to the ETIS data sharing limitations. Only authorized personnel, such as TAG statisticians, and TRAFFIC staff can use the full dataset to reproduce results. At best, Parties can go through the code on-line and, in conjunction with its associated annotation, try to understand how the data preparation and statistical modelling are implemented.

For the purpose of this review, the ETIS database was made available to the statistical consultant responsible for the review and therefore the scripts have been analyzed running the ETIS data. The first observation is that the code published online does not represent the general ETIS methodology but refers to the specific code used to produce the report for CoP18. One example that can explain this better, is the fact that, the script that shows the calculation of the interpolation of covariates is not published on GitHub and therefore could not be analyzed. The interpolation of covariates is done when some covariates[40] do not have the most recent data and therefore interpolations solve this issue. This step of the ETIS methodology, although mentioned, is not explained. Apparently, interpolation was not done for CoP18 analysis and therefore this script was not published in GithHub.

While running the code, several errors were encountered by the statistician consultant responsible of this review. The same errors were experienced by Prof. Carl Schwarz, a member of the MIKE-ETIS TAG.

A new improved version of the code that can be run smoothly without experiencing any errors was produced by Daniela Di Filippo, the statistician responsible for this review, and Sharon Baruch-Mordo, the TRAFFIC Senior Analyst. The new version can be accessed here:
https://www.dropbox.com/sh/mbcp8al7fn4aazl/AACkRfWKn78gkWWi-ojpT8lka?dl=0

The details relating to the errors encountered in the code version published on GitHub are provided in Annex A.

4.3 Recommendations

An informal review of the ETIS code was conducted by the two MIKE-ETIS TAG statisticians in 2019, and some of their recommendations are supported by this review and included in the list below.

4.3.1 A full review of the ETIS code should be carried out. This would include streamlining some processes and scripts. At present, the code version published on GitHub cannot be run smoothly and it requires solving different technical problems before being able to obtain the output analysis. An improved version has been produced but the code remains quite out of date.

4.3.2 The theoretical framework of the ETIS methodology needs be updated and any changes / updates should be clearly described in a single document before any modifications are made to the R code. The code should reflect what is described in the documented methodology and not vice versa. At the moment, the documents that describe the theory of the ETIS methods are not sufficient to fully understand the methodology. It was necessary to reverse engineering the code to fully understand the theory. Other than not being good practice, this clearly prevents non-technical people to fully understand the ETIS methods.

[40] Covariates are explained in chapter “Review of overall ETIS methodology, technical outputs and reports”.

4.3.3 RMarkdown should be used to document the code. This creates a living document that links existing scripts together. The advantage is that an Rmarkdown document can be automatically updated as code fragments are updated. An RMarkdown is quite a technical instrument, and it may be the case that only statisticians will be able to run it. In this regard it is important to clarify whether the code's reproducibility is to be limited to statisticians only or if Parties would like to keep it "less-technical" in order make it easier to be run. CITES Parties should clarify who they are targeting in terms of the audience for the R code and if the intention is to enable Parties to run the code and replicate results.

4.3.4 The code published on GitHub shouldn't be customized for a specific ETIS report. Rather, it is recommended that the code accessible to Parties should include all the passages mentioned in the ETIS methodology. An example is the script relating to the interpolation of covariate data that is used to estimate the latest data when these are missing. Given that this script is usually applied, and for transparency purposes, missing scripts should be published regardless of the fact that for a particular ETIS report they weren't used.

4.3.5 The way the data are captured from the ETIS database with PostgreSQL and then loaded in R needs to be urgently reviewed. Apparently, this process does not run well with the Run Ruby application and it creates problems with capturing the source of information of the seizures. When running the data in R there are 14,590 seizure that have the Source Reliability filed as Blank. The presence of blanks has consequences on the determination of the Data Collection Score which is one of the two proxies used to determine the Reporting Rate.

Detailed technical recommendations relating to the code:

4.4.6 Inconsistencies between scripts should be addressed, including for example the consistent use of one term for weight (not wts and wgts); and using the functions of one package, when possible, to make the code easier to use and more homogenous (the functions of the R package "tidyverse" are mostly used, but it is not uniformly applied).

4.4.7 Use functionals as an alternative to 'for loops'. As described in the ETIS methodology, the scripts were developed in 2009-2013 and were subsequently updated to adapt the code to the new elements of the ETIS methodology. At the moment, the code appears to be quite old and difficult to run, and one of the reasons is the heavy use of 'for loops'. The downside of 'for loops' is that they're not very expressive. A 'for' loop gives a command over another piece of command and when this is done too many times, it becomes difficult to convey a high-level goal. Instead of using a 'for loop', it's better to use a functional. Each functional is tailored for a specific task, so when the user recognizes the functional it is easy to immediately know why it's being used. Functionals reduce bugs in the code by better communicating the intent of the mathematical operations.

4.4.8 The file published online on GitHub that explains to Parties how to run the scripts, should be revised, and explanations on how to run the following 10 scripts should be included: 1) df_ctry_add_fn.R, 2) df_quantities_rie_separate.R, 3) get subsid vars.R, 4) ggplot theme.R, 5) posterior distributions for lambda theta phi.R, 6) rhat functions.R, 7) select final data.R, 8) sql select countries oetd.R, 9) transaction index and plots.R, 10) weight index and plots.R. Although statisticians could determine how to run these scripts, it is important to document how to run each and every script used.

4.4.9 Referring to columns by numbers should be avoided. The order of columns could change, and the R script would then be out of sync with the data.

4.4.10 The use of T and F for TRUE and FALSE respectively should be avoided. R package conventions (and strong package checking) flag such usage as "non-conforming" because it is then too easy to accidentally create a variable T or F that is used in place of TRUE and FALSE.

4.4.11 Explicit error messages should be given when things go wrong. For example, in the Select final data.R script the code suggests:

```
# Make sure everything matches
# Are the files the same size - nrow(df.szs) – nrow(df.covars)
```

but no error message or warning is issued if this is not correct. It is recommended to create a FLAG.ERROR() function that puts out a message so that it is obvious to the person running the code that a problem exists.

4.4.12 Assuming that data frames have rows in a particular order should be avoided. The use of cbind() should be avoided in favor of merge() when joining two data frames. It is recommended to never refer to rows by row number but by selection criteria.

4.4.13 Convert to simple plots in base R. This way there are no dependencies on packages that change over time and consequently reduce the reproducibility. In the ETIS code this is done only in the posterior-predictive-plots where the base R graphics are used.

4.4.14 There are more updated and convenient packages to write codes with these characteristics, it is recommended to use modern packages like for example “Data Table”.

5. Data interpretation and assumptions

Data interpretation refers to the implementation of statistical processes through which data is reread with the help of pertinent information. The objective is arriving at conclusions that take into account the context and characteristics of the data being analyzed. Interpretation assigns a new meaning to the data, and it suggests different perspectives on the possible implications[41].

In statistics, like in all mathematics disciplines, to infer valid conclusions, certain characteristics about the data are assumed, and these are known as statistical assumptions. Assumptions are often influenced by data interpretation, or often times are set a priori by the analyst. One example is the notorious Law of Demand: The Law of Demand says that at higher prices, buyers will demand less of an economic good and vice versa, given the same quality. This is true when it is assumed that a buyer is rational and does not buy driven by emotions or by how trendy a particular brand is. This type of assumption would therefore be completely wrong in the case of luxury goods, when the buyer is not rational or simply when the buyer does not have enough information to judge the quality of a good. Assumptions must be made carefully because incorrect assumptions can generate inaccurate conclusions.

5.1 ETIS Data assumptions and interpretations

TRAFFIC uses different assumptions and interpretations; some are made in data collection phase while others are made when covariates are used. The cluster analysis is interpreted by TRAFFIC with the help of auxiliary data while seizures are assumed to be biased.

In this section, the interpretations and assumptions made in the ETIS analysis are explained in detail. The information provided is based on consultations with TRAFFIC or from documents that TRAFFIC made available for the purpose of this review.

During the data collection phase, Data Providers (DPs) have the opportunity to communicate specific details pertaining to ivory seizures, including the country of origin of the ivory (Question Number 6 "Country(ies) of origin" present in all ETIS forms). When DPs (Parties in this case) declare that the ivory is coming from more than one country, TRAFFIC assigns equal percentages of the ivory specimens to all countries involved. For example: If two countries are identified as countries of origin by a DP, 50 % of ivory specimens seized will be assigned to each country. This happens in the absence of forensic examination. If forensic analysis is done, more precise percentages are assigned to the countries of origin based on the forensic analysis reports.

Another form of data interpretation concerns the assumption that ETIS data are regarded as biased data (TRAFFIC definition of biased data is provided in the text below in italics) and hence covariates are used to adjust the data that are submitted by DPs. The following is the explanation provided by TRAFFIC about the bias and how it is corrected:

> "*The statistical challenge with illegal ivory seizures data is that countries differ in their ability to make and report seizures and these differences are not directly measurable. Hence simple summaries of illegal ivory seizures data will be biased. For example, two countries may report the same number of illegal ivory seizures to ETIS in any one year suggesting that they have similar levels of illegal ivory activity in their country. In fact, country A may have very good law enforcement and so seize a large proportion of illegal ivory shipments that pass through the country. In addition, this country may also have the resources to ensure that all such seizures are reported to ETIS. In comparison, country B may have very poor law enforcement so that only a very small proportion of illegal ivory shipments that pass through the country are seized. Furthermore, the person responsible for reporting these seizures to ETIS may have so many other commitments that they do not report many of these seizures to ETIS. Thus, there is much more illegal ivory trade activity in country B than in country A but a simple summary of the number of reported seizures by each country does not demonstrate this".*

[41] OECD definition: https://stats.oecd.org/glossary/detail.asp?ID=2973

What is considered to be biased[42] is the Seizure Rate (in model denoted as ϕ) and the Reporting Rate (in the model denoted as θ):

i) Bias in the Seizure Rate: Not all illegal ivory transactions within a country result in ivory seizures, and the proportion of illegal transactions that results in ivory seizures in a country, the Seizure Rate, is unknown. For these reasons, the Seizure Rate is estimated with the use of two proxies: The one year-lagged Law Enforcement Ratio and the Trade Chain Index, two predictors that discriminate different country's ability to make seizures.

ii) Bias in the Reporting rate: Not all seizures that are made are reported to ETIS thus the proportion that is reported by a country, the Reporting Rate, is also unknown. For these reasons the Reporting Rate is estimated with the use of two proxies: The Data Collection Score and the CITES Reporting Score, two predictors that discriminate different country's ability to report seizures.

The following table explains the variables mentioned above:

DEFINITION	**EXPLANATION**
One-year Lagged Law Enforcement Ratio	$Seizures\ in/\ (seizures\ in + seizures\ out)$ Seizure In: Country of discovery that is the Country that made the seizure Seizure Out[43]: All the countries on the trade chain of the seizure that had the opportunity to make a seizure but failed to do it until it reached the country of discovery
Trade Chain Index	The TCI for a country in a particular year is calculated as the log of the ratio of two scores: Destination Score: The number of times that the country is listed as a country of destination, divided by the number of seizures in which a country of destination is given. This is calculated separately for seizures of raw and worked ivory, and the average of these two values is taken. There are over three times as many worked ivory seizures as raw ivory seizures records which report more than just the country of discovery. Without calculating the score separately for raw and worked ivory the index would be biased towards the role that a country plays in the trade chain for worked ivory. Non-destination Score: The average of the equivalent score for origin, export and transit countries. For example, the Export Score is the number of times that the country is listed as a country of export divided by the number of seizures in which a country of export is provided. Again, this is calculated separately for raw and worked ivory and the average of the raw and worked scores is taken.
Data Collection Score	The proxy is calculated based on the effort made by CMAs (CITES Management Authorities) and ETIS to report and obtain ETIS data. The proxy is calculated as the proportion of records in a year that came from targeted, prompted and passive[44] means which are the three modalities assigned to the ETIS Data Collection efforts.

[42] The use of the term "Bias" is used in accordance to the ETIS methodology. The use of other terms, perhaps more appropriate, will be taken into consideration by TAG members in consultation with TRAFFIC.

[43] The seizure out can be calculated in two different ways:

- To estimate a measure of Law Enforcement Ratio the seizure is counted as a *seizure out* only for countries that had an opportunity to make a seizure.
- To estimate Trade Flows the seizure is counted as a *seizure out* for all countries on the trade chain (that are not the country of discovery) because the intent is to capture the intended known pathway of each transaction.

[44] The definition of the Data Collection Efforts targeted, prompted and passive is provided in the Chapter on Data Collection

	The more a CMA needs TRAFFIC intervention to report the data the more it is assumed that its real reporting rate is biased hence needs to be adjusted.
CITES Reporting Score	It is an indicator based on each country's experience in fulfilling reporting requirements to the CITES Secretariat. The variable is calculated as the number of CITES Annual Reports submitted as a proportion of the number of years the country had been a CITES Party. The idea is that this proportion could be taken as an indicator of the seriousness with which the country meets its obligations under CITES (including reporting to ETIS). The data required for this ratio are provided by the CITES Secretariat (Geneva).

The paper "Dissecting the Illegal Ivory Trade: An Analysis of Ivory Seizures" by Underwood, Burn and Milliken (2013) PlosOne Journal[45] models the seizure and reporting probabilities as functions of covariates (on the logit scale), i.e.

$$logit(\phi_{iy}) = linear\ f(country\ and\ year\ standardized\ covariates)$$
$$logit(\theta_{iy}) = linear\ f(country\ and\ year\ standardized\ covariates)$$

The ETIS modelling framework identifies proxy variables used as covariates that account for some of the differences in reporting and seizure rates between countries and over time. From this bias-adjusted and smoothed estimates of illegal ivory trade activity are calculated.

Another assumption, which directly relates to the previous assumption / interpretation, is used when the covariates are 0. The seizure and reporting probability are arbitrarily set to be 0.5 when the standardized covariates take the value of 0. The following example is given to explain this in more detail: The factor $1/(\theta$ x $\phi)$ is an adjustment to the observed data to account for the probability of seizure and reporting. For example, if after observing the covariates it is assumed that only 1/3 of illegal ivory is seized and 1/2 is reported, then only 1/3 x 1/2 = 1/6 of illegal ivory is reported in the database. Hence, every record that is available, represents 6 illegal ivory transactions, only 1 of which is reported. Each country and year have a different bias-adjusting factor, so the data are first bias adjusted and then analyzed. The bias adjustment in the example provided would be to assume that the real seizure number for that particular country is 6 instead of 1.

The underlying parameters of the ETIS methodology can be arbitrarily multiplied and divided by constants. For example, the value of k as expressed in the following formula[46]

$$\mu_{iyk} = \lambda_{iyk}\phi_{iy}\theta_{iy} = (\lambda_{iyk}/k)\ (k\phi_{iy})\ \theta_{iy} = \lambda^*_{iyk}\theta^*_{iy}\theta_{iy}$$

could vary from country-to-county and year-to-year. Consequently, it is not possible to estimate the parameters uniquely unless some further assumptions are made about the seizure and reporting probabilities.

Interpretations and assumptions change according to the specific covariate used. Different covariates have been used for different CoP reports hence different assumption have been made over the years[47]. This raises concerns about the comparability of data over time.

5.2 Recommendations

5.2.1 The method for assigning the percentages of seized ivory to the country of origin (50%-50% as in the example above) should be clearly explained in the ETIS forms and in the ETIS methodology. At the moment there is no mention about this assumption in the documents relating to methodology released

[45] https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0076539
[46] The formula is taken from the paper "Dissecting the Illegal Ivory Trade: An Analysis of Ivory Seizures" written by Underwood, Burn and Milliken (2013) PLUS ONE.
[47] An in-depth analysis of the different covariates used over the years is shown in Chapter "Review of overall ETIS methodology, technical outputs and reports".

to Parties. It is recommended that Parties be informed about this assumption. TRAFFIC indicated that the new tool ETIS online will provide more transparency relating to this assumption.

5.2.2 Based on consultations with ETIS stakeholders at various levels (not only Parties) it was clear that in some instances there is confusion about the covariates used. This could be due to the fact that covariates have been changing, for methodological purposes, over the years. The use of different covariates over time creates challenges in terms of consistency and comparability of results. It is recommended that the ETIS data are analyzed over the years using the same set of covariates otherwise results cannot be considered comparable/consistent. If covariates have to change for scientific purposes the limitations associated with this method should be clearly explained.

5.2.3 Parties should be requested to specify the method they use to determine the country(ies) of origin of a seizure.

5.2.4 The use of the CITES Reporting Score as a covariate to determine reporting rate should be re-evaluated. The use of CITES Reporting Score to estimate a country's Reporting Rate implies that if a country doesn't report consistently on the other CITES reporting commitments, then it means that the country is also not reporting consistently to the ETIS program. This proxy does not appear to be robust. For example, in the case of reporting on SDGs[48], there are many countries that for different reasons manage to report well on a few SDG indicators but under-report or do not report any data for other SDGs. This does not mean that the few SDG indicators for which data are reported are automatically classified as under-reported (see UN Sustainable Development Goal report https://unstats.un.org/sdgs/report/2020/).

5.2.5 The proxy, Data Collection Score, should be clarified in the SOP Manual and other documentation relating to the ETIS methodology available to Parties. The Data Collection Score is the second proxy used for country's Reporting Rate. For the reasons explained in Chapter 1, it is not clear how the 3 effort categories are attributed to the data, therefore the proxy itself is not clear.

5.2.6 The definition of the Trade Chain Index, and in particular the definition of Destination Score, should be clarified (concepts of country listed and destination given[49]) in the SOP Manual and other documentation relating to the methodology. TRAFFIC indicated that:

5.2.6.1 *country listed* means the times that a particular country is *listed* in a seizure record as a country of destination, as opposed to

5.2.6.2 *destination given* which means the total number of times the field for a country of destination was given/compiled for all cases for a given year (it is important to note that in many seizure records, the country of destination is not provided/compiled).
For example, if there were 130 cases in a year and 30 cases did not provide a Country of Destination at all, the remaining 100 cases would constitute the number for "destination given" for that year. If countries A, B and C were then found to be mentioned 30, 15 and 6 times as the Country of Destination in that dataset that data would constitute the "destination listed" for those countries in that year.

5.2.7 The use of the Trade Chain Index should be re-evaluated, given that in many seizures the country of destination is not provided. At the moment the model does not account for this limitation. It is recommended to revise this proxy to take into account this limitation.

5.2.8 Destination Score and Non-Destination Score have the same concept in common: that is how a particular field is compiled by Parties. In the case of Destination Score this is the field of "Destination Country". In the case of Non-Destination Score this is the field of "Origin or Export or Transit Country". In the first case, when the field is completed, the country that appears in that field is called "given". In the second case, when the field is completed, the country(ies) that appear in that field(s)

[48] SDGs are the United Nations Sustainable Development Goals. To know more please visit the UN official website https://sdgs.un.org/goals

[49] The terminology "country listed" and "destination given" is used in the Notes file published on GitHub

is/are called "provided" [50]. It is suggested to use the term "provided" for both concepts because their meaning is the same, additionally consistency in terminology is essential to avoid confusion.

5.2.9 Parties must have an opportunity to engage the relevant DP on seizure records in which they are implicated before the data is used in the analysis. The concepts of seizure in/out and the Trade Chain Index involve countries in the trade chain even without communication or consultations between the Parties concerned. It is recommended that if not clearly written in documents, countries that have been involved / implicated by other countries should be made aware of this and should have the opportunity to accept or dismiss the implication based on engagement and available information. It was recommended to insert in the ETIS Online data collection system and in any other ETIS forms a mechanism that detects these cases and provides a possibility of engagement in order to confirm or challenge such involvements. This point was already discussed with TRAFFIC and it has been confirmed that the ETIS Online system facilitates the identification of records submitted by other Parties that implicates a specific Party.

5.2.10 A concern with the ETIS model is the lack of identifiability of the underlying parameters which could arbitrarily be multiplied and divided by constants

$$\mu_{iyk} = \lambda_{iyk}\phi_{iy}\theta_{iy} = (\lambda_{iyk}/k)\,(k\phi_{iy})\,\theta_{iy} = \lambda^{*}_{iyk}\theta^{*}_{iy}\theta_{iy}$$

For example, the value of *k* could vary from country-to-county and year-to-year. Consequently, it is not possible to estimate the parameters uniquely unless some further assumptions are made about the seizure and reporting probabilities. This problem was already pointed out in the informal TAG review. It is recommended to take this limitation into account in the ETIS model.

5.2.11 More quantitative elements relating to illegal trade of ivory should be considered for inclusion in the methodology, as well as triangulation of data from various sources[51]:

- At present, TRAFFIC assumes that seizures are under seized/reported, hence biased. The justification for the bias is that countries differ in their ability to make and report seizures. As such, given that countries may differ in the resources they allocate to law enforcement and their commitment to interdicting contraband elephant products, two countries may make very different numbers of seizures even when they encounter similar amounts of illegal activity. For these reasons, covariates are proposed to correct the bias of seizure and reporting capacities of Parties.

- The justification provided by TRAFFIC to explain the bias does not actually explain why seizures are believed to be under seized/reported. Rather there is a reference to Parties' different capacities which is just a qualitative assessment and not a scientific robust explanation. A scientific robust explanation would instead provide quantitative elements. Example: in country X, 10 elephants have been found illegally killed with their tusks removed. This can clearly be associated with illegal trade of ivory and therefore it is expected that seizures from country X should be reported to ETIS. From the number, age and sex of the elephants illegally killed it is possible to estimate the number of pieces and weights that should be intercepted and reported to ETIS by country X. If those tusks do not appear in the ETIS reported seizure by country X, then we can say that the data are "biased" and this is the justification of the bias. As a consequence, we can also say that country X is having challenges seizing illegal ivory and/or reporting ETIS data.

- At present, the way the ETIS methodology is formulated in terms of the use of the annual CITES trade reports seem to fall outside any connection to factual/quantitative data. Example: one of the

[50] The terminology "country given" and "country provided" is used in the Notes file published on GitHub

[51] As per TOR, recommendations should be provided consulting relevant publications on wildlife illegal trade: this recommendation was provided after having analyzed different illegal trade methodologies, the most relevant of which is the one produced by UNODC and available at this link (page 47)
https://www.unodc.org/documents/data-and-analysis/wildlife/2020/World_Wildlife_Report_2020_9July.pdf
and the following World Bank publication http://documents1.worldbank.org/curated/en/358291518460602605/pdf/The-price-elasticity-of-African-elephant-poaching.pdf

two proxies that estimates a country's reporting rate is the CITES reporting rate. Hence, if a country fulfils its reporting requirements with other CITES reports, then even the ETIS reporting rate of country X is believed to be high/correct. This mechanism is not anchored in factual data related to ivory and or elephants. So, for example, if 10 elephants were actually found illegally killed in country X and not reported to ETIS but at the same time country X has fulfilled its reporting requirements in terms of other CITES' reports, its reporting rate will show an improvement in its ETIS reporting score. This mechanism assumes that poor reporting in terms of CITES reports will result in poor ETIS reporting, but it is not anchored in factual data relating to ivory or elephants or trade in elephant specimens.

- For the reasons explained above, it is recommended that it is important to provide quantitative explanations when it is assumed that data are underreported. This was widely supported by the Parties consulted during this review. The question to ask should be: Is there any quantitative evidence that demonstrates that the illegal trade of ivory is much higher than what is reported in ETIS? Scientific publications (see footnote 48) on the subject suggest that there is quantitative and factual information that can help to explain this assumption, therefore it is important to include these quantitative elements in the ETIS methodology.

- Triangulation of data can help in cases like this. TWIX data collected by TRAFFIC on the same subject could, for example, help in detecting/augmenting ETIS missing information. Ecomessage data, World Custom data, MIKE data, UNEP annual illegal trade data, stockpile data, ivory price data, datasets held by the IUCN/SSC African Elephant Specialist Group's African Elephant Database (elephant numbers) etc. should be used for triangulation of ivory illegal trade data.

- At the moment, these elements are not considered in the ETIS model. Covariates should be proposed taking into account quantitative facts. It is important to note that this review does not challenge the assumption that the illegal trade of ivory is underreported and undersized. The issue is rather how the methodology explains and tries to estimate this bias.

5.2.12 The inputs of an expert in illegal trade in elephant specimens should be considered to enhance the interpretation of ETIS data and inform the further refinement of the methodology. The former ETIS Director, Tom Milliken, and his knowledge and expertise relating to the illegal trade in ivory added enormous value to the interpretation of the ETIS data and analysis. Currently, the MIKE-ETIS Technical Advisory Group (TAG) does not have an expert with the same level of expertise and the addition of a global member with such expertise could add value.

5.2.13 Some of these recommendations are already foreseen in the document written by TRAFFIC "Short- and long-term development plan of ETIS/TRAFFIC program" available in Annex I.

6. Review of overall ETIS methodology, technical outputs and reports

The ETIS methodology uses two types of analysis: Trend analysis and Cluster analysis.

- *Trend analysis:* Trend analysis means looking at how a potential driver of change has developed over time, and how it is likely to develop in future. Rational analysis of development patterns provides a far more reliable basis for speculation and prediction than reliance on mere intuition. Several trends can be combined to picture a possible future for the sector of interest, such as illegal wildlife trade. Trend analysis does not predict what the future will look like; it becomes a powerful tool for strategic planning by creating plausible, detailed pictures of what the future might look like[52].

- *Cluster analysis*: This is a general approach to multivariate problems in which the aim is to see whether the individuals, in this case countries, fall into groups or clusters. There are several methods of procedure; most depend on setting up a metric to define the "closeness" of individuals[53].

6.1 ETIS Trend and Cluster analysis: a short description

In the reports to the CITES CoPs, TRAFFIC usually produced both trend and cluster analyses while the reports for each Standing Committee meeting generally only included a trend analysis. Sometimes, when ETIS data are believed to be heavily under-reported, TRAFFIC shares only data summaries.

For CoPs, the first part of the report consists of a trend analysis that describes how the illegal ivory trade varies over time. Since CoP18, two different measures are used: The Transaction Index (TI) and the Weight Index (WI). The second part of the report is composed of a cluster analysis that identifies countries with similar characteristics. This is used to identify groups of countries of concern and has latterly been used to inform the NIAP process, though this was not its original design or intent.

Between CoP meetings and for Standing Committee meetings, the ETIS report is composed of a trend analysis which provides the TI and WI. This normally includes additional years of data to that used in the CoP report. This type of analysis uses the models developed in the most recent CoP report. Specifically, it uses

(1) the same model for estimating weights from pieces; and

(2) the same covariates to estimate the TI although the model is refitted to the new data so that trends are re-estimated.

One of the requests for this review was to explain the ETIS methodology STEP by STEP in a simple way so that everyone, statisticians and non-technical people, could understand it. Another request concerned TRAFFIC reports, which are perceived by some as quite complex and difficult to understand and a simpler interpretation/explanation of the TRAFFIC reports could enhance the understanding of these reports[54]. This section attempts to do both: offer a simplified explanation of the ETIS methodology as well as the resulting reports. Examples and explanations are taken from the documents that TRAFFIC made available for the

[52] OECD Statistics definition https://www.oecd.org/site/schoolingfortomorrowknowledgebase/futuresthinking/trends/trendanalysisasamethod.htm#:~:text=Trend%20analysis%20means%20looking%20at,to%20develop%20in%20the%20future.&text=Several%20trends%20can%20be%20combined,of%20interest%2C%20such%20as%20schooling.

[53] OECD Statistics definition https://stats.oecd.org/glossary/detail.asp?ID=3615.

[54] Although there was already a TRAFFIC publication "Understanding ETIS" https://www.traffic.org/site/assets/files/3817/understanding-etis-vfinal-web.pdf that had the objective of explaining the ETIS methodology in simple terms, it was made clear that one of the objectives of this review was to further simplify the ETIS methodology. This review touches some of the points that were not covered in the publication "Understanding ETIS" : data preparation of ETIS analysis, explanation of the different set of covariates used in different CoPs reports, data-interpretation by TRAFFIC and their implications, simple explanation on how the graphs used in ETIS reports should be read, a more detailed explanation of the cluster analysis and how clusters and cut-off points are determined, explanations of how the NIAP categories are determined and limitations of the ETIS methodology.

purpose of this review. Examples are mostly taken from the report of CoP18, which is the most recent and complete report.

6.2 Data preparation for ETIS analysis

Before any trend or cluster analysis is conducted, ETIS data are prepared to make it suitable for the analysis. In this section the stages of data preparation are described:

i) **A dataset is extracted from the global ETIS database and prepared for the analysis.**

This dataset is formed by all ETIS data (seizure data) categorized under 3, 4 and 5 Status Categories[55]. After this, all the checks described in Chapter "Data Validation" are performed, and internal inconsistencies are resolved by double-checking the data collected and their sources.

ii) **Missing weights are imputed**[56].

As explained in Chapter 2 (Data Collection), many ETIS records do not include weights and therefore weight data are imputed. Imputation does not estimate piece by piece, but ivory is estimated into the 5 weight classes. There is considerable uncertainty with respect to the weights of seizures reported to ETIS. In 2013, TRAFFIC estimated that only 47% of records received reported the weight of the seizure. For the most recent years, approximately 50% of ETIS records provide the number of pieces only, without any indication of the weight of the ivory seizure. Other records that do specify a weight are often estimates rather than precise measurements. Missing weights are imputed by building a model that uses data from ETIS seizure records where both the number of pieces and seizure weights are recorded.

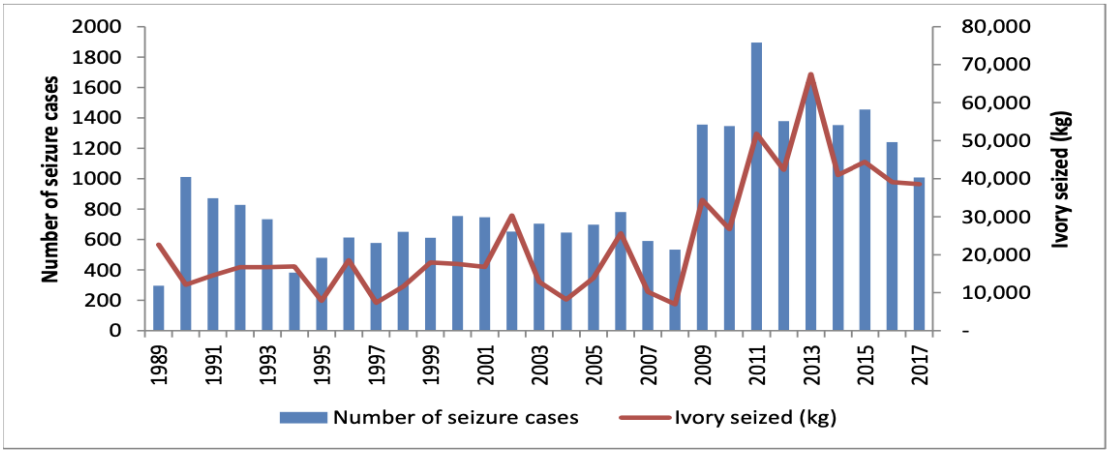
The model is revised and updated when preparing an analysis for a CoP report. The current procedure is that in between CoPs, for example for analyses for Standing Committee reports or when the ETIS team need to make other summary reports, the model used for the report to the CoP is used for the subsequent Standing Committee meeting reports. Then, with each successive analysis for a CoP report, a new model is fitted using existing data plus the new data that have been submitted since the last CoP.

Weights are estimated taking into account seizure data from 1989 up until the latest year of data collection. To show how the weights have been imputed and to depict the non-biased adjusted data aggregates, TRAFFIC usually provides a graph like the one reported below where it is possible to see the reported number of ivory seizure cases and their estimated weights. The example below is extracted from the report to CoP18 (years concerned are 1989-2017). It is important to emphasize that, according to the ETIS methodology, the figure below[57] cannot be interpreted as a trend, because of the inherent bias that is assumed in the data in terms of seizure and reporting rate[58] by countries and over time.

To compare raw and worked weights the Raw Ivory Equivalent (RIE) is calculated by dividing worked ivory weights by 0.7 to account for an average 30% loss of ivory in the carving process.

[55] The Status Categories are explained in Chapter 2 (Data Validation).
[56] In statistics, imputation is the process of replacing missing data with substituted values. Imputation has the objective of preserving the data by replacing missing data with an estimated value based on other available information. Once all missing values have been imputed, the data set can then be analyzed.
[57] Figure 1 is taken as an example from TRAFFIC CoP18 report.
[58] Seizure Rate and Reporting Rate are explained in Chapter 5 (Data Interpretation and Assumptions).

Figure 1: Number of ivory seizure cases and estimated weight of ivory by year, 1989 - 2017
(ETIS raw data, 06 June 2018)



iii) **Not all CITES Parties are included in the analysis**.

Countries are included if over the last 10-year period (for example for CoP18 the period was 2008 – 2017) they scored at least 100 using the following formula:

1 * Number of small seizures (less than 10kg)

+ 10 * Number of medium seizures (between 10kg & less than 100kg)

+ 100 * Number of large seizures (at least 100kg).

For example, a country that made a single large ivory transaction (100*1=100), or a country that was implicated in nine medium seizures and made ten small seizures (9*10 + 10*1= 100), would become part of the analysis.

This calculation includes both: countries that made the seizures and countries that are implicated by other countries for being present in one or more stages of the trade chain associated with the seizure (source of seizure, import, export, transit, re-export, destination).

iv) **Extraction of covariates**.

The covariates used for the various CoP reports have not always been the same. The following table describes the covariates used for Seizure and Reporting Score before CoP16 and for reports submitted to CoP16, 17 and 18.

	Seizure Rate Proxies					**Reporting Rate Proxies**	
	The one year-lagged Law Enforcement Ratio	**Current year's Law Enforcement Ratio**	**The Trade Chain Index**	**Country's rule of law World Bank governance indicator**	**Transparency International's Corruption Perception Index**	**CITES Reporting Score**	**Data Collection Efforts Score**
Before CoP 16[59]	x				X	X	X Targeted, Routine,

[59] Information about ETIS reports done before CoP16 are taken from CoP16 report page 4, Bias Adjustment section.

	Seizure Rate Proxies					Reporting Rate Proxies	
	The one year-lagged Law Enforcement Ratio	**Current year's Law Enforcement Ratio**	**The Trade Chain Index**	**Country's rule of law World Bank governance indicator**	**Transparency International's Corruption Perception Index**	**CITES Reporting Score**	**Data Collection Efforts Score**
							Prompted, Passive
CoP 16	X			X		X	X[60] Targeted, Routine, Prompted, Passive
CoP 17[61]		X				X	X Targeted, Prompted, Passive
CoP 18	X		X			X	X Targeted, Prompted, Passive

Some of the covariates are extracted from the ETIS Subsidiary Database[62] (CITES reporting score, Country's Rule of Law of World Bank and Transparency International Corruption Perception Index), while others are extracted directly from the ETIS seizure data (Law Enforcement Ratio and Data Collection Efforts Score).

The following 4 types of covariates were used[63]in the report to CoP18.

i. The one year-lagged Law Enforcement Ratio and the Trade Chain Index were the two covariates used to estimate the *Seizure Rate*

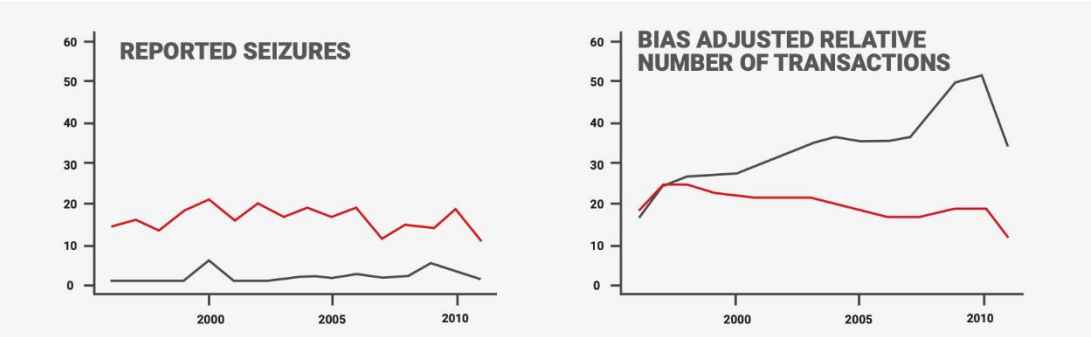
ii. The Data Collection Score and the CITES Reporting Score were the two covariates used to estimate the *Reporting Rate*.

v) Application of covariates and estimation of new ETIS data called Bias-Adjusted Data.

ETIS identifies possible reasons as to why countries differ in their ability to make and report seizures, and then identifies data, or covariates, that might help understand these differences. The ETIS analytical framework uses these covariates to adjust ETIS records[64]. What is obtained are different relative seizure and reporting rates, below is an example of how the ETIS data collected change after the bias adjustment. The graphs below are copied from the TRAFFIC publication "Understanding

[60] CoP 16 report, page 4 and 5 Bias Adjustment section.
[61] Source CoP 17 report, page 6 "In contrast to previous ETIS assessments, however, measures of governance did not prove useful in explaining variability, including rule of law from the World Governance Indicators of the World Bank (which demonstrated correlation in the CoP16 analysis but became far less important in the two follow-on trends analyses presented to CITES Standing Committee meetings). This may be because general governance indicators for countries at a national scale may not effectively reflect the more specific micro-environment through which wildlife trade crime unfolds; the reduced time period may also be a factor".
[62] The ETIS subsidiary database has been described in the Data Collection chapter.
[63] The role of covariates in the ETIS programme and their interpretation are explained in the chapter "Data Interpretation".
[64] Source "Understanding ETIS".

ETIS" (page 6). The dataset that will be used to calculate the Trends and Cluster analysis is the bias-adjusted dataset, as shown in the second graph.



"*The example above compares reported seizures from* ***Country A*** *and* ***Country B*** *over a 15-year period, before and after bias adjustments are applied. Without any bias adjustment, data would otherwise indicate that the Country A is a consistently more significant actor within global ivory supply chains than Country B. However, the number of incidents by country changes significantly once bias adjustments are applied, giving a far more accurate representation of each country's position within global ivory trade*[65]".

6.3 Trend analysis

Resolution Conf. 10.10 (Rev. CoP18) calls for ETIS to measure "*levels and trends, and changes in levels and trends*" concerning illegal trade in ivory.

The ETIS Trend analysis consists of the following calculations:

- ◊ *Transaction Index (TI):* An estimation of illegal ivory trade transactions calculated by ivory weight classes and aggregated totals of weight classes (raw and worked ivory is reported separately – trends for each are produced).

- ◊ *Weight Index (WI):* An estimation of the quantity of illegal ivory traded each year. It is estimated using the TI where for each simulated transaction, a weight is simulated. WI is based on weight classes too.

To calculate both TI and WI, ETIS data are organized in five ivory classes:

- two ivory types (raw and worked) and
- three weight categories small (less than 10 kg), medium (between 10 and 100 kg) and large (over 100 kg).

TI and WI are estimated for each of these five ivory classes:

i. Raw <10kg;
ii. Raw 10 – 100kg;
iii. Raw 100kg+;
iv. Worked <10kg,
v. Worked 10kg+.

It is important to emphasize that estimates provided by TI and WI are relative and not absolute numbers. The difference between relative and absolute numbers:

[65] Source "Understanding ETIS".

- *Absolute numbers* or values are the real/precise numbers. For example, 6 cities or 100 people.
- *Relative numbers* or values are in most cases a fraction of other numbers, in other words they depend on other numbers. For example, 2 in 5 people live in the cities. You still do not know the precise number of people that live in the cities, so you could say that you know that 40% or 2/5 of people live in the cities without knowing the real number associated with this percentage.

6.3.1 ETIS Trend Analysis: The Transaction Index

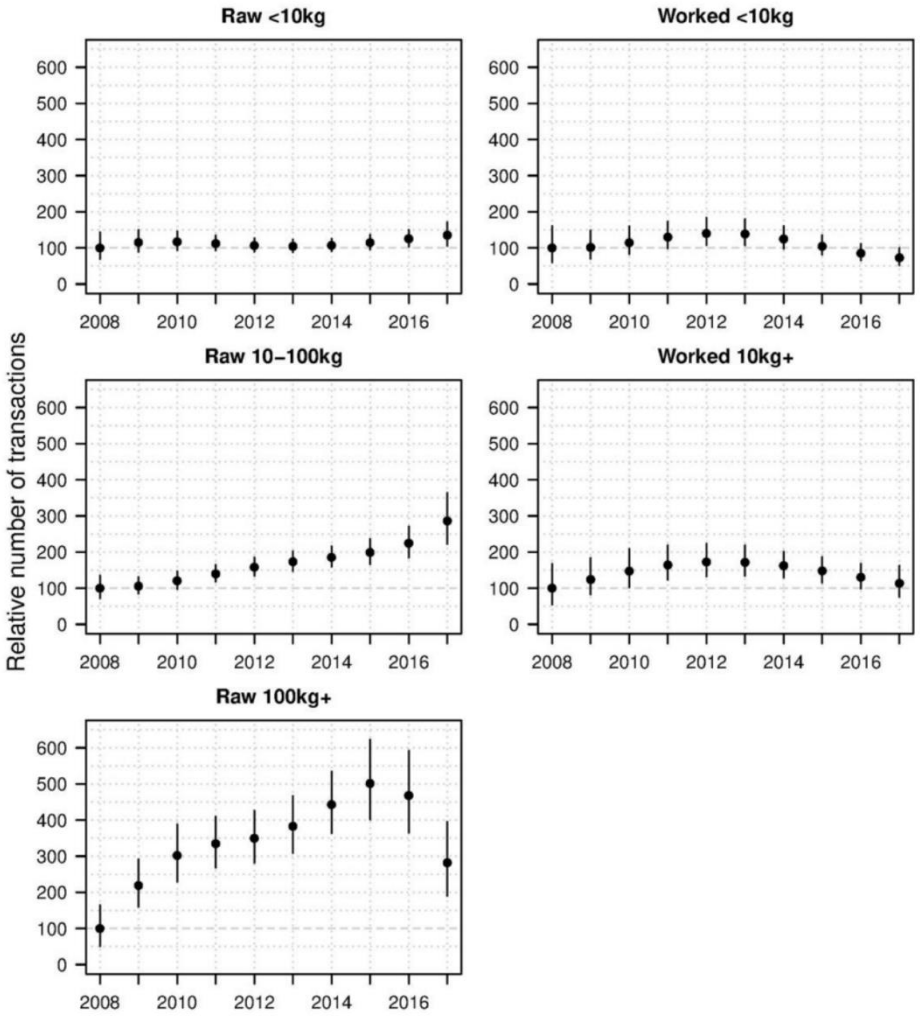
The Transaction Index (TI) is an estimation of the number of illegal ivory trade transactions. It is derived to describe trends in illegal ivory-trade transactions, and it depicts global illegal trade activity in the five ivory-classes described above.

TI is based on bias-adjusted data. To account for different seizure and reporting rates, each ivory class provides a measure of the frequency of raw and worked ivory transactions occurring over the 10-year period selected.

To describe the results of the TI, TRAFFIC normally provides 7 graphs. The first 5 correspond to the 5 ivory classes and the last 2 represent the transaction aggregate values.

Below is an example of how the **TI for the 5 categories** is reported in an ETIS report to meetings of the Standing Committee and CoP (Figure 2 below was taken from the CoP18 report).

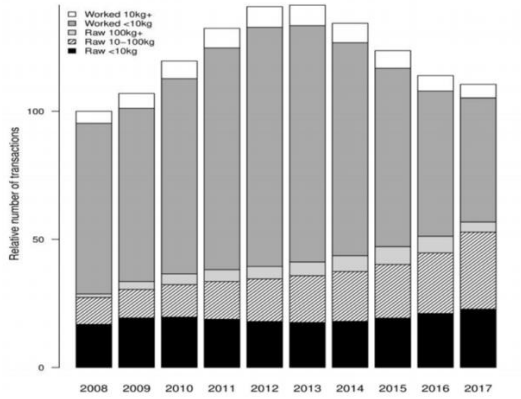
Figure 2: ***Trends in Transaction Index by ivory type and weight category with mean (bold dot) and 90% confidence intervals, 2008-2017*** *(ETIS, 06 June 2018)*



Each graph represents an ivory class. The horizontal axis of the graphs represents the years while the vertical axis of the graphs represents the relative[66] number of transactions. How precise are these estimates? The best estimate of relative annual transactions is the bold dot within the vertical line while the vertical line represents the uncertainty of the estimated value, the longer this line is, the more uncertain is the value represented by the bold dot.

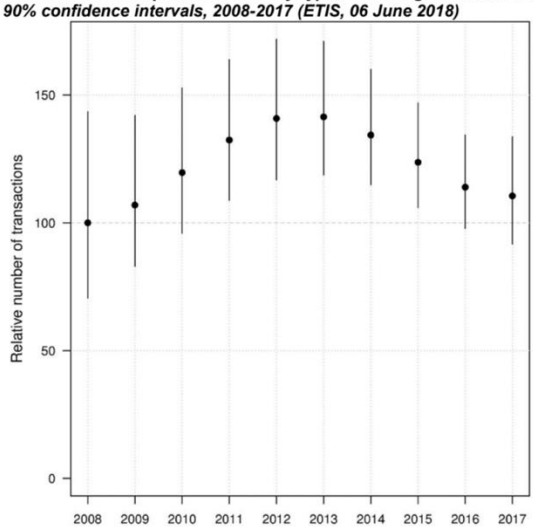
The **TI with aggregated totals** is reflected in 2 graphs that show the TI combining weight classes by ivory type (see Figure 3 below) and the TI composite of all ivory classes and weight classes (see Figure 4 below). The two graphs show the same information given above in Figure 2 (where each graph represents an ivory class), but this time the data are shown in total aggregates. In the first graph (Figure 3), the 5 different shades, represent the 5 different categories (before there was a graph per category while now, they are aggregated). Here it is much simpler at the visual level to see which of the 5 categories is the one that is illegally more traded (more transactions). Based on this graph it is the class (category) defined as worked ivory with weight less than 10 kg. The category that is traded the least (less transactions) is the class (category) raw ivory with weight more than 100 kg.

Figure 3: Transaction Index combining weight classes by ivory type, 2007-2014 *(ETIS, 21 June 2018)*



The second graph (Figure 4) should be interpreted like the graphs in Figure 2 but this time, the data are aggregated without differentiating by categories. In other words, it shows the (relative) total estimated transactions of illegal ivory per year and the uncertainty of each estimate.

Figure 4: Transaction Index composite of all ivory types and weight classes with mean (bold dot) and 90% confidence intervals, 2008-2017 (ETIS, 06 June 2018)



[66] The first year in the time series is set to 100 and other year's TI are standardized to that. The programme also standardizes the values so that the total Transaction Index for the first year is 100 (because the index is a relative index rather than an absolute index). In the depicted figures in this review, TIs are relative to 2008, which pinned at 100.

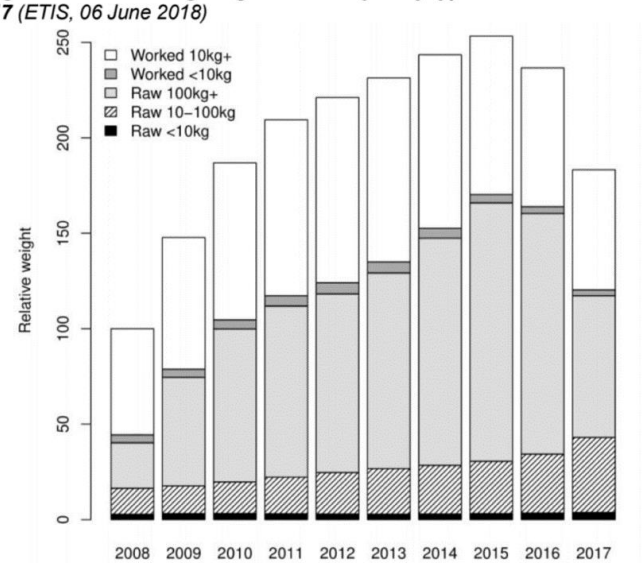
6.3.2 ETIS Trend Analysis: The Weight Index

The Weight Index estimates the relative quantity of illegally traded ivory by ivory type and by weight classes (these are the 5 categories described above: Raw <10kg; Raw 10 – 100kg; Raw 100kg+; Worked <10kg, Worked 10kg+). The WI is estimated combining the Transactions Index with a model for assigning weights to each seizure in each weight class. As previously explained, ETIS is not designed to provide absolute weight values of illicit ivory trade, rather it provides aggregated patterns by weight categories of bias-adjusted data.

TRAFFIC normally provides two graphs to describe the results obtained from the WI analysis.

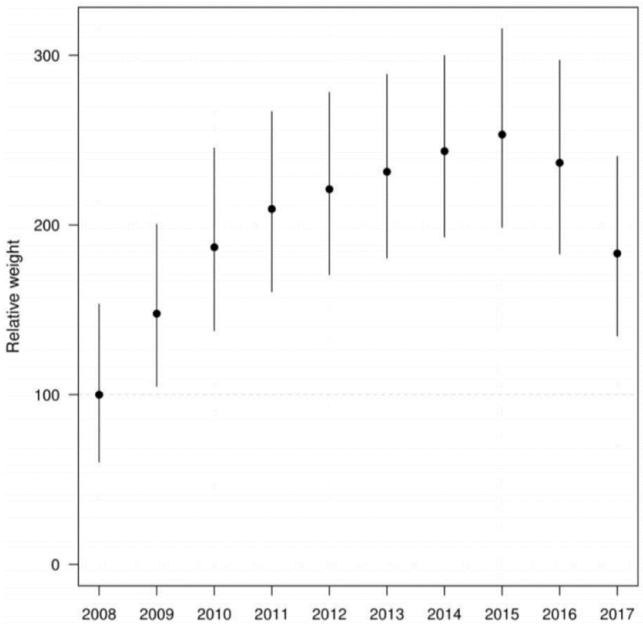
The following two graphs were extracted from the CoP18 report. The graph in Figure 5 reports the 5 different shades which represent the 5 categories. The horizontal axis represents the years while the vertical axis represents the (relative) weight in kgs. It is easy to see that the transactions that register heavier weights of ivory are the worked ivory with a weight of more than 10 kg (white) and the raw ivory with a weight of more than 100 kg (light gray).

Figure 5: ***Weight Index combining weight classes by ivory types with 90% confidence intervals, 2008-2017*** *(ETIS, 06 June 2018)*



The second graph (Figure 6) puts the focus on the (relative) total weights traded year by year and it is clear that there was an increment of weight in 2015 while the lowest (relative) total weight is registered in 2008.

Figure 6: ***Weight Index composite of all ivory types and weight classes with mean (bold dot) and 90% confidence intervals, 2007-2017*** *(ETIS, 06 June 2018)*



6.4 Cluster Analysis

The purpose of the Cluster Analysis is to identify countries with similar characteristics[67]. This helps Parties identify countries that are most prominently implicated[68] in the illegal ivory trade so that appropriate interventions can be considered. Additionally, a cluster analysis allows for the comparative assessment of the role of countries in the illegal ivory trade for a specific time period, which usually are the latest three years. The countries that are taken into consideration for the cluster analysis are the ones that score at least 100 after calculating the formula explained in paragraph 6.2 of this chapter.

To identify which country falls in which cluster, similar characteristics are identified[69] and clusters are formed. To identify similar characteristics 11 bias-adjusted variables are analyzed and these are:

List	Name of the bias-adjusted variable	Variable's explanation	Reason why the variable is considered to form the clusters
1 – 5	Transaction Index by Ivory type **1.** Raw **2.** Worked and Weight categories **3.** Small (less than 10 kgs) **4.** Medium (between 10 and 100 kgs) **5.** Large (over 100 kgs)	The Transaction Index (TI) is an estimation of the number of illegal ivory trade transactions made by each country in the different categories.	These measures serve to compare the relative role of each country in the number of transactions (raw and worked separately).
6 – 7	The total of 'Seizures Out'[70] for **6.** less than 500 kg (raw and worked combined) and **7.** that were 500 kg or more (raw and worked combined)	The number of seizures in which a country has been implicated as part of the trade chain but did not make the seizure itself although it had an opportunity to do so. This means that if, for example, a country is registered in the trade chain (trade chains are provided by the country that make the seizure) as a country of destination but the seizure was made before reaching it, the country of destination is not calculated in the Seizure Out.	This measure serves to compare law enforcement performance, but only in cases where law enforcement action would have been possible.
8	The total of 'Weights In' that were 500 kg or more (raw and worked combined)	The weight in kg of seizures made by a country	This measure serves to compare the relative quantity of ivory being seized coming into a country in larger consignments.
9	The total of 'Weights Out' that were 500 kg or more (raw and worked combined)	The weight in kg of seizures in which a country has been implicated as part of the trade chain irrespective of where the seizure took place	This measure serves to compare relative ivory trade flows in terms of the quantity of ivory coming from, leaving or moving through a country in larger consignments.
10	The total of 'weights in' that were 500 kg or more	The weight in kg of seizures made by a country	This measure serves to compare the relative quantity of ivory

[67] It is not clear what are the similar characteristics that TRAFFIC takes into account. This point was also raised by ETIS-TAG statisticians.

[68] "Most prominently implicated" is a terminology used by TRAFFIC in their ETIS report (reference is made to COP18 report). The cluster analysis is more of a descriptive or exploratory analysis and not an inferential one. Thus, the idea that it's used to implicate countries seems potentially problematic. This point was raised by ETIS TAG statisticians.

[69] TRAFFIC does not specify what metric was used to measure "distance" between countries. This should be clarified. This point was also raised by ETIS-TAG statisticians.

[70] To calculate weights in/out and seizure out other bias- adjusted variables are created by summarizing bias-adjusted values of individual seizures. This second bias-adjustment (the first bias-adjustment concerns the use of covariate to estimate seizure and reporting score) consists of:

- the seizure weight multiplied by the bias-adjustment factor - for calculating the *weights in* and *out*
- (one multiplied by) the bias-adjustment factor - for calculating the *seizures out* variable

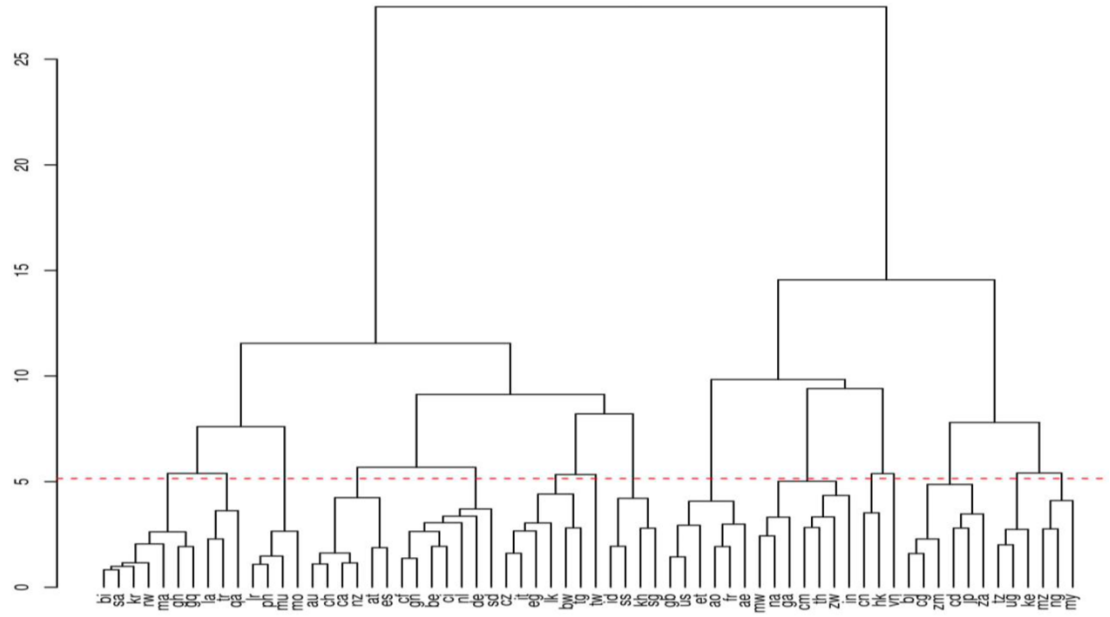
The bias-adjustment factor is the reciprocal of the product of the country of discovery's seizure (ϕ) and reporting (θ) rate for that year. That is for seizures discovered in country i in year t the bias adjustment factor is: $1/\phi_{it}\,\theta_{it}$

	(raw and worked combined)		being seized by a country in larger consignments
11	The total of 'Weights Out' that were 500 kg or more (raw and worked combined)	The weight in kg of seizures in which a country has been implicated in the trade chain irrespective of where the seizure took place. Contrary to the 'Seizure Out', this means that if for example a country is registered in the trade chain (trade chains are provided by the country that make the seizure) as a country of destination, even if the seizure did not arrive there, the country of destination will be counted in the 'Weights Out'.	This measure serves to compare relative ivory trade flows in terms of the quantity of ivory coming from, leaving or moving through a country in larger consignments.

It is important to note that in the cluster analyses for CoP16 and CoP17, the weight limit was one ton rather than 500kg. For CoP18, there were not that many seizures of at least one ton and so it was decided to use a cut-off of 500 kg instead[71].

The results of the cluster analysis are reported by TRAFFIC in the form of a dendrogram. An example is the following graph (Figure 7) taken from CoP18 report.

Figure 7: ***The cluster analysis*** *(ETIS data, 06 June 2018)*



[71] The authors of the methodology report that for larger seizure there is a second bias adjustment, also referred to as a post hoc approximate: "A particular feature, of great interest to CITES, not captured by these ivory classes is the occurrence of large-scale shipments, which can be defined as shipments over one ton in weight. To include these seizures in the cluster analysis some form of bias- adjustment should be applied to their observed numbers, just as the Transaction Indexes for the ivory classes are bias-adjusted. A post hoc approximate method of adjustment was sought. Using the basic factorization of the mean number of seizures in the main model, namely $\mu_{ikt} = \lambda_{ikt}\phi_{it}\theta_{it}$, the observed number of large-scale seizures is divided by the appropriate estimated seizure rate and reporting rate and define the bias-adjusted number Y_i and weight W_i of seizure in country i". Source: Burn, R.W. and Underwood, F.M. (2012). A new statistical modelling framework to interpret ivory seizures data: A technical report describing the new modelling framework for analyzing seizures data from the Elephant Trade Information System. Section 4.2 Cluster Analysis.

How to read the dendrogram?

Different clusters can be observed in the dendrogram (Figure 7) with each cluster consisting of all countries joined by the vertical line that intersects the horizontal line.

- The degree of vertical separation between different countries provides a relative measure of dissimilarity based on the distance along the vertical axis.

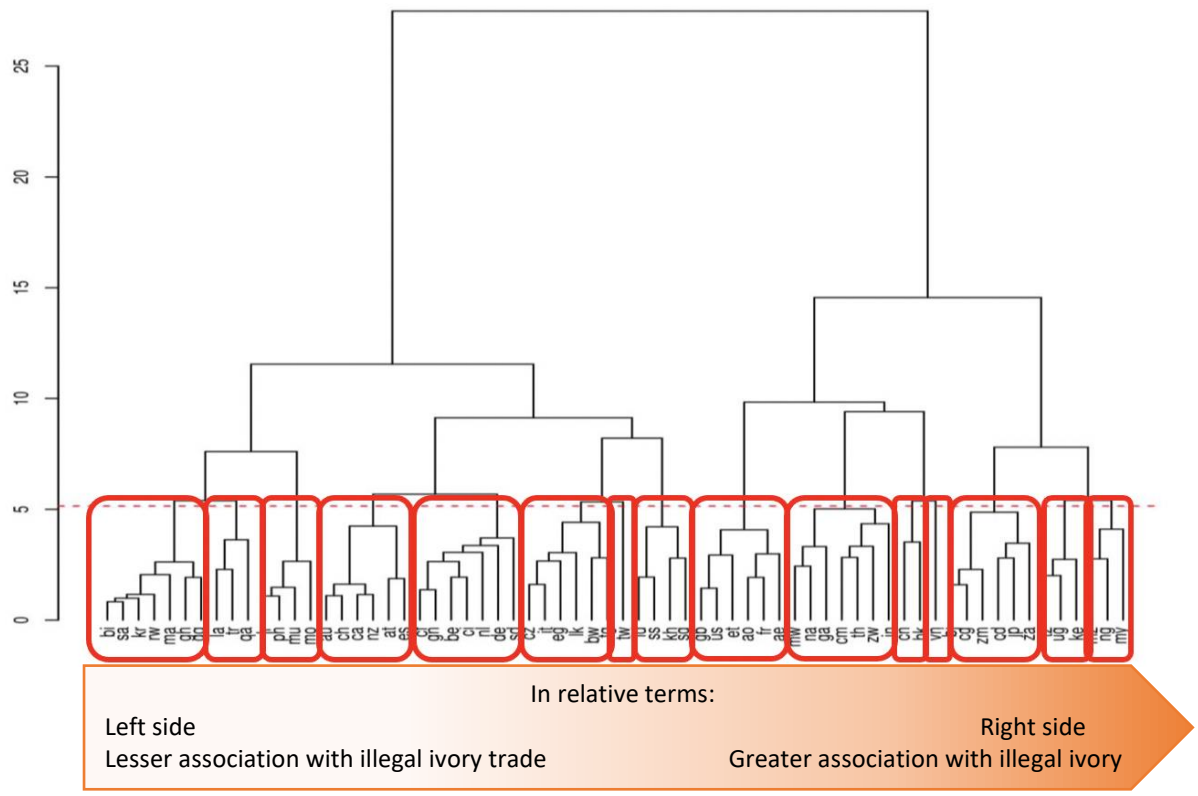
- A horizontal line, like the red one drawn at the height of 5, can be drawn at any height in the dendogram to partition the countries into a number of clusters. For example, drawing a line at the 20 mark (a cut-off of 20) gives the two clusters which correspond to the two vertical lines. A cut-off (or line) at around 10 would result in 4 groups. A cut-off (or line) close to zero gives 66 different groups where each group is formed by one country.

- Changing the cut-off and the number of clusters/groups does not change the results of the analysis; it provides a different level of detail for describing each group's characteristics of the countries that fall in each cluster.

- In the example above, taken from CoP18 report, the cut-off of 5 was decided by the TRAFFIC analysts. This created 15 groups or clusters where in each cluster there are between 1 and 7 countries. TRAFFIC explains that "*the decision of the cut-off was subjective to a degree, but this cut-off was chosen after careful inspection of the data because it was felt to give sufficient detail to discriminate between countries taking different roles in the trade. At best, the cluster groups exhibit an unambiguous logic in terms of the underlying attributes, but not all groups have a clear cohesion in terms of all definable characteristics. Finally, given that the variables in the cluster analysis are based on modelled outputs, a sensitivity analysis was conducted to assess the interconnections and unity of the components that form each cluster. With some exceptions a very high degree of cohesiveness was found, especially for those clusters considered for prioritization*".

- In the graph below each circle corresponds to one cluster. The total number of circles is 15 and each cluster is delimited by the vertical line that is touched by the horizonal red line.

Figure 7: ***The cluster analysis*** *(ETIS data, 06 June 2018)*



- The groups or clusters positioned towards the right side of the dendrogram are considered to be more associated with the illegal ivory trade than those on the left side.

  In the report to CoP18, the 15 clusters or groups are the following as numbered by TRAFFIC starting from the right side of the dendrogram to the left side of the dendrogram:

  - Cluster / Group 1: ***Malaysi****a (MY)*, ***Mozambique*** *(MZ)*, ***Nigeria*** *(NG)*
  - Cluster / Group *2* – ***Kenya*** *(KE)*, ***United Republic of Tanzania*** *(TZ)*, ***Uganda*** *(UG):*
  - Cluster / Group *3* – ***Benin*** *(BJ)*, ***Democratic Republic of the Congo*** *(CD)*, ***Congo*** *(CG)*, ***Japan*** *(JP)*, ***South Africa*** *(ZA)*, ***Zambia*** *(ZM)*
  - Cluster / Group *4* – ***Viet Nam*** *(VN)*
  - Cluster / Group *5* – ***China*** *(CN)*, ***Hong Kong SAR*** *(HK)*
  - Cluster / Group *6* – ***Cameroon*** *(CM)*, ***Gabon*** *(GA)*, ***India*** *(IN)*, ***Malawi*** *(MW)*, ***Namibia*** *(NA)*, ***Thailand*** *(TH)*, ***Zimbabwe*** *(ZW)*
  - Cluster / Group *7* – ***United Arab Emirates*** *(AE)*, ***Angola*** *(AO)*, ***Ethiopia*** *(ET)*, ***France*** *(FR)*, ***United Kingdom of Great Britain and Northern Ireland*** *(GB)*, ***United States of America*** *(US)*
  - Cluster / Group *8* – ***Indonesia*** *(ID)*, ***Cambodia*** *(KH)*, ***Singapore*** *(SG)*, ***South Sudan*** *(SS)*
  - Cluster / Group *9* – ***Taiwan Province of China*** *(TW)*
  - Cluster / Group *10* – ***Botswana*** *(BW)*, ***Czech Republic*** *(CZ)*, ***Egypt*** *(EG)*, ***Italy*** *(IT)*, ***Sri Lanka*** *(LK)*, ***Togo*** *(TG)*
  - Cluster / Group *11* – ***Belgium*** *(BE)*, ***Central African Republic*** *(CF)*, ***Côte d'Ivoire*** *(CI)*, ***Germany*** *(DE)*, ***Guinea*** *(GN)*, ***Netherlands*** *(NL)*, ***Sudan*** *(SD)*
  - Cluster / Group *12* – ***Austria*** *(AT)*, ***Australia*** *(AU)*, ***Canada*** *(CA)*, ***Switzerland*** *(CH)*, ***Spain*** *(ES)*, ***New Zealand*** *(NZ)*
  - Cluster / Group *13* – ***Liberia*** *(LR)*, ***Macau SAR*** *(MO)*, ***Mauritius*** *(MU)*, ***Philippines*** *(PH)*
  - Cluster / Group *14* – ***Lao People's Democratic Republic*** *(LA)*, ***Qatar*** *(QA)*, ***Turkey*** *(TR)*
  - Cluster / Group *15* – ***Burundi*** *(BI)*, ***Ghana*** *(GH)*, ***Equatorial Guinea*** *(GQ)*, ***Republic of Korea*** *(KR)*, ***Morocco*** *(MA)*, ***Rwanda*** *(RW)*, ***Saudi Arabia*** *(SA)*

It should be noted that from the next step and until the determination of the categories A, B, C that informs the NIAP process, TRAFFIC doesn't use "strict statistical calculations" to reach conclusions, but rather expert knowledge to carry out the interpretation of data as described in the next sections. Therefore, the calculations reported in the R code end here.

6.4.1 Aggregate summary statistics to assess the results of the cluster analysis

After the clusters have been identified, TRAFFIC prepares an additional table that presents aggregated summary statistics of raw data (or in other words the data are not bias-adjusted[72]) for the clusters (in the report

[72] TRAFFIC reports that although the cluster analysis uses bias-adjusted summaries, "it is reasoned that using summaries of the original data as provided by the Parties is the best way to explain the characteristics of the clusters".

to CoP18, there were 15 clusters/groups) which are then used to comparatively describe salient characteristics of the various groups.

Six variables are used to assess the clusters/groups and these are explained below. It is important to underline that the variables in the cluster analysis were bias-adjusted; therefore, the clusters or groups were created using bias-adjusted variables, while the interpretation of the clusters / groups is informed by non-bias-adjusted variables (raw data as received).

These variables are used as explanatory elements of the ETIS analysis once the cluster analysis has produced the dendrogram and the clusters (groups) have been determined.

	Name of the variable	**How is it measured?**	**What does it measure?**	**Meaning of results**
1	*Frequency*	Measured by the 'mean number' of reported seizures in the latest three years included in the analysis[73]	The total number of all seizures which were made by, or have implicated, each country/territory in the group divided by the number of entities in the cluster	High numbers indicate greater frequency; low numbers indicate lesser frequency
2	*Scale*	Measured by the 'mean estimated weight' of reported seizures in the latest three years included in the analysis	The total estimated weight of ivory represented by all seizures which were made by, or have implicated, each country/territory in the group divided by the number of entities in the cluster	High numbers indicate greater weights of ivory; Low numbers indicate lesser weights of ivory
3	*Law enforcement effort, effectiveness, and rates of reporting*	Measured by the mean Corruption Perception Index of Transparency International in the period of the latest three years	The total *CPI* score for each country divided by the number of countries/territories in the cluster divided by the number of years	Scores range from 1 (weakest governance performance) to 100 (strongest governance performance).
4	*Law enforcement effort, effectiveness and rates of reporting*	Measured by the 'mean LE Ratio' in the period of the latest three years	The total number of in-country seizures divided by the total number of seizures which were made by, or have implicated, each country/territory in the group divided by the number of entities in the cluster	Ratios range from 0.00 (no law enforcement effort) to 1.00 (best law enforcement effort)
5	*Involvement of organized crime*	Measured by taking the proportion of the mean weight in reported seizures that represent large-scale seizures in the period of the latest three years	Those seizures which are equal to or greater than 500 kg of ivory (RIE) weight in which a particular country/territory either made or was implicated	High values suggest the presence of organized crime in the movement of ivory; low values suggest the absence of organized crime in the movement of ivory
6	*Domestic ivory market score*[74]	Measured by the 'mean market score'	It is a means to assess the relative scale of domestic	Scores range from 1 (no domestic ivory market) to 9

[73] In the example of CoP18 report, the latest three years are 2015, 2016 and 2017

[74] During consultation TRAFFIC reported that "*We have found that understanding the relative status of domestic ivory markets in countries, whether large, medium, small or nonexistent, is useful in describing why they fall in particular clusters or not and*

	Name of the variable	How is it measured?	What does it measure?	Meaning of results
			ivory markets around the world comparatively based on published ivory market survey reports and other information.	(very large domestic ivory market): ○ **9:** > 40,001 pcs or > 5,921 kg ○ **8:** 20,001 - 40,000 pcs or 2,961-5,920 kg ○ **7:** 10,001 - 20,000 pcs or 1,481-2,960 kg ○ **6**: 5,001 - 10,000 pcs or 741-1,480 kg ○ **5:** 1,001 - 5,000 pcs or 151-740 kg ○ **4:** 501 - 1,000 pcs or 74-150 kg ○ **3:** 51 - 500 pcs or 7.4-74 kg ○ **2:** < 50 pcs or < 7.4 kg ○ **1:** None

The following explanatory variables are based on, or derived from, the original ETIS data collected: *Frequency, Scale, LE ratio and Measure of Organized Crime (measured by the proportion of large-scale ivory seizure to mean weight).* The other explanatory variables are taken from other sources of data, such as the Corruption Perception Index of Transparency International and the Domestic Ivory Market Score, which comes from market survey reports produced by TRAFFIC as well as other NGOs.

For single country clusters, the statistics reflect the data for that particular country only, but for clusters comprised of two or more countries, the statistics represent the mean of all countries in the cluster.

The table that is compiled using the 6 additional variables explained above usually looks like the one reported in the following table contained in the CoP18 report (Table 3).

understanding their primary role in the trade as source, export, transit or destination countries. The 1 to 9 score is based on the data concerning what was observed in various ivory markets".

Table 3: ***Summary explanatory variables to describe the 13 cluster analysis groups based on ETIS seizure data before bias adjustment and other sources of data, 2015-2017.Clusters shaded grey are in the major right-hand side cluster grouping (indicating higher levels of illicit trade).***

		Measure of Frequency	*Measure of Scale*	*Measures of Law Enforcement Effort Efficiency*		*Measure of Organised Crime*	*Measure of Domestic Ivory Trade*
Group	Countries or territories	Mean no. of seizures[1]	Mean weight (kg)[2]	Mean CPI[3]	Mean LE Ratio[4]	Proportion of large-scale ivory seizures to mean weight[5]	Mean market score[6]
1	MY, MZ, NG	112	16,849	34.44	0.21	0.75	4.67
2	KE, TZ, UG	194	11,836	28.11	0.90	0.59	1.33
3	BJ, CD, CG, JP, ZA, ZM	88	3,589	39.17	0.61	0.45	4.00
4	VN	153	32,054	33.00	0.46	0.69	6.00
5	CN, HK	611	13,919	57.83	0.90	0.57	6.50
6	CM, GA, IN, MW, NA, TH, ZW	93	3,451	34.33	0.77	0.30	3.43
7	AE, AO, ET, FR, GB, US	275	2,490	57.72	0.69	0.00	4.17
8	ID, KH, SG, SS	16	5,957	38.67	0.41	0.76	3.25
9	TW	9	963	62.00	0.88	0.89	3.00
10	BW, CZ, EG, IT, LK, TG	21	646	44.56	0.82	0.00	2.83
11	BE, CF, CI, DE, GN, NL, SD	42	727	48.14	0.60	0.34	4.00
12	AT, AU, CA, CH, ES, NZ	25	318	78.22	0.70	0.00	3.00
13	LR, MO, MU, PH	1	6	30.50	0.00	0.00	2.50
14	LA, QA, TR	25	3,486	44.67	0.11	0.59	4.00
15	BI, GH, GQ, KR, MA, RW, SA	11	241	37.81	0.00	0.00	2.86

6.5 Determination of categories A, B and C for the National Ivory Action Plans (NIAPs)

The National Ivory Action Plans (NIAPs) process is a practical tool under the direction of the Standing Committee to address illegal ivory trade by strengthening ivory trade controls, supporting law enforcement and improving awareness by identifying countries in three categories of concern:

• Category A “Parties consist of Parties most affected by the illegal trade in ivory”;

• Category B “Parties consist of Parties markedly affected by the illegal trade in ivory”; and

• Category C “Parties consist of Parties affected by the illegal trade in ivory”.

Since CoP 16 the ETIS analysis to CoPs helps to identify Parties that should participate in the NIAP process. Categories A, B and C are assigned as an outcome of the ETIS analysis, but the CITES Parties, through the Standing Committee and based on recommendation from the CITES Secretariat, hold the decision-making power and determine which Parties will enter and exit the NIAP process.

As described above, the method used in the ETIS methodology to determine which countries fall in the various categories (A, B or C) is based on the interpretation of the dendrogram and the aggregate summary statistics used as explanatory elements of the cluster analysis (these are the 6 variables that are not bias-adjusted).

To better explain how this decision is reached, the CoP18 report is used as an example.

As described by TRAFFIC and in Figure 7 above, the countries that fall on the right side of the dendrogram are the ones more associated in the illegal trade of ivory. Also, the groups are numbered from the far right of the dendrogram (Group 1 will therefore include Malaysia, Mozambique and Nigeria; Group 2 include Kenya, United Republic of Tanzania, Uganda, China and Hong Kong SAR; etc) with Group 1 being the first cluster and hence the one more associated with the illegal trade. The order determined by the cluster analysis doesn't automatically form the NIAP categories because, additional aggregate summary statistics are consulted as well (table 3). There are no specific criteria assigned to each NIAP category and the final determination relies heavily on expert interpretation of the outcomes of the cluster analysis and the aggregated summary statistics.

In the CoP18 report, the categories assigned after assessment / interpretation of the aggregate summary statistics were the following:

Category A: ***Malaysia***, ***Mozambique, Nigeria (cluster 1) and Viet Nam (cluster 4)***

*Category B****: Kenya***, ***United Republic of Tanzania*** and ***Uganda (cluster 2) China***, ***Hong Kong SAR*** (cluster 3)

Category C: ***South Africa, Republic of the Congo and Democratic Republic of the Congo (Cluster 3)***, ***Cameroon, Gabon, Zimbabwe (Cluster 6)***, ***Angola, Ethiopia, United Arab Emirates (Cluster 7)***, ***Cambodia, Singapore (cluster 8)***, ***Gabon***, ***Lao People's Democratic Republic, Turkey (Cluster 14)***, and ***Burundi (cluster 15).***

6.6 Recommendations

6.6.1 Documenting the ETIS methodology

After consultation with ETIS stakeholders, it is clear that there are various levels of understanding of the ETIS methodology and that not all stakeholders understand the methodology from beginning to the end. This includes Parties, the CITES Secretariat and to some extent TRAFFIC. The authors of the ETIS methodology are no longer part of TRAFFIC, and the new analyst responsible for the statistical methods hasn't received a detailed handover that allows to have a full command of the methodology. In addition to this, the methodology is not explained in a single document. Rather several documents need to be consulted to have an understanding of the process from the beginning (data collection) to the end (categorization of countries for the NIAP- A, B, and C). The methodology was first published in 2013. After 8 years of changes, some documents are out of date, and it is necessary to determine the chronological order of the changes to clearly assess the latest version of the methodology. For these reasons, it is recommended that:

i) A more user-friendly, up-to-date and comprehensive document should be developed for the use of non-statisticians to assist them to fully understand the methodology. This should be provided along with training to interested Parties and CITES staff. In this chapter an attempt was made to simplify and explain the ETIS methodology in a way that is understandable to the broader public, and it can be used as a basis to implement this recommendation.

ii) A more technical document and training should be provided to the CITES Secretariat that is responsible to introduce the TRAFFIC reports to Parties, with TRAFFIC available for addressing technical queries and explaining the analysis. It is essential that CITES Secretariat staff fully understands the methodology and the analysis produced in order to better explain such reports to Parties. The current Standard Operating Procedure (SOPs) Manual could be used (if appropriately updated) to develop this document. The document must then be made available to Parties as well through the ETIS page on the CITES website or at least, given TRAFFIC's resistance to publicly share their SOPs, to CITES and to the MIKE-ETIS TAG. TRAFFIC should furthermore offer online and in person information sessions aimed at explaining the ETIS statistical methods and all technicalities associated to the ETIS methodology to interested Parties.

iii) It is recommended that TRAFFIC organizes a complete handover to the analyst responsible for the ETIS methodology. In addition, it is recommended that the methodology is documented in a single document from beginning to the end, i.e., from data collection to the determination of the 3 categories that inform

the NIAP process. This document should be updated as needed and be the main source of documentation. The current method of reporting updates in different documents and reports to the CoPs and SC is not recommended.

6.6.2 *Documenting limitations and assumptions*

The ETIS methodology, as all mathematical and statistical methodologies, has some limitations. It is a good practice to explain very clearly what these limitations are, and how they can affect the results. This information is particularly useful for the Standing Committee and the CITES Secretariat for determining which country should be recommended to enter the NIAP process. It is recommended that the following limitations are explained in the methodology document:

i) The implications of making assumptions and in particular assuming that the data are biased.

ii) Limitations when data are not given or availed, and hence need to be estimated, e.g., in the case of ivory weights.

iii) The implications of using covariates and the effect of each covariate. As an example: Parties should understand that if CITES annual trade reports are not submitted as required then this underreporting will also be reflected in the ETIS analysis. After consultations, it seems that not all ETIS stakeholders understand this.

iv) Difference between relative and absolute values.

All the limitations that are normal and contemplated in a statistical model should be better explained. This review has attempted to do so, and the limitations reported here can be considered as a basis to implement this recommendation.

6.6.3 Use of bias-adjusted data and data summary statistics

Although any statistical model has its own limitations, internal coherence should be respected and when not, it should be explained why. It is not clear why the TREND analysis and the CLUSTER analysis are based on bias-adjusted data, but then the interpretation and final determination of the categories considered in the NIAP process is informed by non-bias-adjusted data. TRAFFIC explains that the reason for which countries cannot be compared with each other is because they have different capacities in seizing and reporting data and for this reason a bias-adjust mechanism is sought. The same logic is dismissed while assessing the result of the cluster analysis with the 6 non-bias-adjusted variables: "*Some of these explanatory variables are based on, or derive from, the original ETIS data provided by the contributors of data to ETIS, prior to bias adjustment. The cluster analysis uses bias-adjusted summaries of these data, but it is reasoned that using summaries of the original data as provided by the Parties is the best way to explain the characteristics of the clusters".*[75]

It is recommended to better explain the reasons behind this choice.

6.6.4 Documenting the sensitivity analysis

It is recommended that TRAFFIC makes documentation available relating to the sensitivity analysis that assesses the quality of the cluster analysis and reported to show "very high degree of cohesiveness". For the purpose of this review, it was not possible to consult the results of this sensitivity analysis. The countries that form the cluster are quite different from each other, and some clusters are difficult to understand. This is particularly true with clusters / groups 10 and 11 of the CoP 18 report, and it is not clear enough what these countries have in common in terms of illegal ivory trade.

6.6.5 Selecting countries for analysis

[75] COP18 Report

It is important to note that the countries that are included in the ETIS analysis are countries that score at least 100 after having reported seizures or having been implicated by other countries that made seizures. After consultation with some countries, it was clear that some Parties either were not aware or did not agree about being implicated by another Party, and it is recommended that the ETIS methodology takes into account a process to verify this data.

6.6.6 Data used to inform categorization of countries

The Parties that were consulted strongly recommended that the NIAPs categorization should be based on factual data only. Concerns were raised about the use of other qualitative data like the Corruption Perception Index to inform the categorization of countries. This review recommends that additional sources of factual data should either substitute or complement qualitative indicators. At the moment it seems there is an effort to consult additional data that give information on the profile of the countries rather than additional data on the characteristics of the illegal ivory trade country by country. For example, it is assumed that Parties are under reporting, based on the CPI or according to how diligently they fulfill other CITES reporting requirements. There is no consideration of the number of elephants illegally killed around the world and how this number can inform the estimation of the illegal trade of ivory. Additional data sources should be consulted to determine whether the trends observed are similar, e.g., TWIX data, Eco-messages, WCO data and MIKE data. What is recommended here is also supported by this UNODC publication (2020) on illegal trade of ivory https://www.unodc.org/documents/data-and-analysis/wildlife/2020/World_Wildlife_Report_2020_9July.pdf.

6.6.7 Interpolation of missing data in covariates

The ETIS methodology describes that when covariate data for the latest year are not available, interpolations are done to solve this issue. The R script on this interpolation method is not available / accessible. Theorical explanations of interpolation methods are also not available. It is recommended to provide both practical calculations done in R, and theorical explanations associated with this solution.

6.6.8 Changes in the proxies used

The proxy "Data Collection Efforts Score" was formed by 4 elements (targeted, routine, prompted and passive reporting) before CoP 16 and for the analysis for CoP 16. From CoP 17 onwards the scores were reduced to three elements (targeted, prompted and passive). It is recommended that an explanation is provided about why this change was made and to which category the data classified as "routine" were assigned.

Same recommendation as above for the Law Enforcement Ratio. The one-year lagged ratio was used for the analysis prior to CoP16 and the analysis done for CoP16 and CoP18, while for CoP17 the current year Law Enforcement Ratio was used.

6.6.9 Use of different covariates over the years

Different covariates produce different results. The table in the section "Extraction of Covariates" describes how the use of covariates has been changing over the years. It is recommended to compare data that come from the same methodology and hence the same covariates otherwise the limitations / assumptions associated with this choice should be better explained.

6.6.10 Perceptions associated with ETIS reporting

After consultation with several Parties, it was clear that some Parties found it challenging to understand the results of the ETIS analysis because of differences, in some instances, between the data declared in the data collection process by the Party and data reported in SC and CoPs reports. For example, they felt that the more seizures they report, the more likely it is that they end up in the NIAP process. It is therefore important that Parties understand that the ETIS analysis is not built on strictly what Parties declare. An attempt to explain this was reported in the section "Application of covariates and estimation of new ETIS data called Bias-Adjusted data" where a graph with red and black lines that was extracted from the "Understanding ETIS" brochure clearly explains how much the collected data can change after the bias-adjustment.

6.6.11 Measure of Domestic Ivory Trade variable

The variable called "Measure of Domestic Ivory Trade" appears for the first time in the reports to CoPs. In the reports to CoP16 and CoP17, the variable is referred to as "Measure of Internal Ivory Trade" and in the report to CoP18 as "Measure of Domestic Ivory Trade", but in all three reports it is measured through a "mean market score". There is no mention about this variable in the documentation concerning the methodology. Additionally, the explanation of the variable is not provided in the CoP reports. The explanation reported this review (precisely in table of paragraph 6.4.1) was provided by TRAFFIC during the review consultation process and it is recommended that the same explanation is made available in the subsequent ETIS reports. Additionally, it is not clear why this variable is used to inform the determination of the categorization of Parties given that the data collected are not homogeneous on domestic illegal trade (TRAFFIC also recognizes this limitation). Indeed, it has been noticed that many countries only report international seizure and not domestic seizure therefore this cannot be seen as a fully reliable information, unless the limits of using this variable are very clearly explained.

6.6.12 Cluster Analysis

It is not clear what are the similar characteristics that TRAFFIC takes into account to group countries into clusters.

"Most prominently implicated" is a terminology used by TRAFFIC in their ETIS report (reference is made to CoP18) when describing the results of the cluster analysis. The cluster analysis is more of a descriptive or exploratory analysis and not an inferential one. Thus, the idea that it's used to implicate countries seems potentially problematic.

TRAFFIC does not specify what metric was used to measure "distance" between countries. All the above points should be clarified. All the above points were also raised and supported by the ETIS-TAG Statisticians.

Additionally, ETIS' stakeholders and users are not aware that the categorization of the NIAP categories does not follow the results obtained from the cluster analysis. Rather, the categorization is determined applying qualitative criteria (after the cluster analysis). This qualitative process can also change the results of the cluster analysis and introduce new countries for the participation of the NIAP process.

7. ETIS assessment: Meeting the objectives in Resolution Conf. 10.10 (Rev. CoP18) and supporting CITES processes and decision-making

The Terms of Reference requires the consultant to determine whether the processes used by TRAFFIC sufficiently contribute to achieve the objectives of ETIS as specified in the Resolution and whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan (NIAP) process. From a statistical point of view, and given the explanations provided in all the previous chapters (1-6), the ETIS program, notwithstanding challenges over the years, has been successful in meeting the objectives as specified in the Resolution and has realized critical impacts that bode well for the monitoring of illegal trade of ivory. The overall assessment is that ETIS' performance can be rated as "Satisfactory". The recommendations contained in the report should be considered to further strengthen the system and to address areas that require clarification or further consideration. ETIS performance is assessed based on the rubric further elaborated in **Annex K**.

Summary of Ratings	
Evaluated Process	***Rating***
Data collection	**Satisfactory**
Data validation	**Satisfactory**
Data management	**Satisfactory**
Data analysis (R-code and algorithm used for analysis)	**Satisfactory**
Data interpretation	**Moderately Satisfactory**
Review of overall ETIS methodology, technical outputs and reports	**Moderately Satisfactory**
Overall review rating	**Satisfactory**

The recommendations provided in the previous chapters have been grouped and summarized in the table below. If more information, context and details are required, the relevant chapters should be consulted, given that the table below is not meant to provide the full content and details. Responsibilities have been assigned to each recommendation although most are to be addressed by TRAFFIC while the CITES Secretariat and the MIKE-ETIS TAG also have a role to play.

It is important to remember that there are a number of sections in the SoP that provide explanations relating to various aspect of the methodology and data management processes that can be instrumental in enabling the Parties and all stakeholders to have a better understanding of how data is managed and how the statistical models are executed. In order to make informed decisions, going forward, the CITES and MIKE-ETIS TAG should have access to the SoP, the code-base, and all other supporting documents for ETIS.

The column "Time Frame" has three categories:

- ***Short-Term*** means that a recommendation is relatively easy to implement and usually does not require additional budget to be implemented. Most of these types of recommendations concern aspects that form part of the ETIS methodology that already in place but that needs to be better explained to all ETIS stakeholders.

- A ***Medium-Term*** recommendation will require more time to be implemented but may not necessarily require additional funding. For example, most of these recommendations are about the simplification and modernization of the R code along with some reflections on the robustness of some elements used in the ETIS methodology. These are activities that require time but not necessarily extra funds as they can be implemented by TRAFFIC's Senior Analyst in collaboration with the MIKE-ETIS TAG.

- ***Long-Term*** recommendations require more time and, in most cases, additional funding. These relate to more structural changes to the ETIS methodology.

No	Recommendations	Who	Time frame
DATA COLLECTION			
1	The implications that each method of data collection has on the Data Collection Score should be clarified. Both smart visual schematic and detailed information on data collection scoring methods should be provided.	TRAFFIC	Short-Term
2	Clarify definitions and adopt consistent terms to identify the categories of Data Collection Efforts. The definitions of TRAFFIC's collection efforts should be further clarified: (1) Targeted, (2) Prompted, and (3) Passive. It is recommended that TRAFFIC provides a precise description of how these categories are assigned, and according to which modalities of data collection.	TRAFFIC	Short-Term
3	Use only one phrase to indicate the minimum set of data without which the seizures cannot be part of the ETIS analysis. This review recommends adoption of the term "Minimum Required Information".	TRAFFIC	Short-Term
4	There is confusion about what information constitutes the Minimum Required Information. This should be clarified and explained to Parties (see Annex B).	TRAFFIC	Short-Term
5	Explanatory Notes – following to be provided / clarified: 7.1 "Required information" means that without the Minimum Required Information the seizure cannot be included in the analysis. It is recommended to include this important information in ETIS documents. 7.2 "Required Information" in the ETIS Data Collection Form does not match with what is reported in its Explanatory Notes. It is recommended to modify the two documents. 7.3 The definition of "seizure" and "confiscation" is not provided. It is recommended to provide both definitions. 7.4 It is not clearly mentioned that the seizures on which information must be submitted refer to both national and international illegal trade. It is recommended that this should be explicitly stated. 7.5 Create an Explanatory Notes file as a separate worksheet within the Excel file dedicated to the Excel Template and to number the Excel's questions like the ETIS Form and the ETIS online reporting system	TRAFFIC	Short-Term
6	Insert a new field in the three ETIS data collection forms to ask whether the seizure reported concerns national or international illegal trade. This additional information should be clearly specified as it is particularly valuable for the calculation of the Train Chain Index[76].	TRAFFIC	Short-Term
7	TRAFFIC SOPs report that there are 8 different methods of data collections. This review has reduced them to 6 in order to avoid duplications. It is recommended to change this in the SOPs as well.	TRAFFIC	Short-Term
8	The information on nationality of suspects in not used in the ETIS analysis therefore it is recommended to remove this question.	TRAFFIC	Short-Term
9	The communication relating to the deadline for submission of data should clarify that ETIS data should be communicated within 90 days and not every 90 days.	TRAFFIC	Short-Term
10	Parties to be consulted before including any unofficial data into the ETIS dataset.	TRAFFIC	Short-Term
11	Given that Eco messages and TWIX data contain the Minimum Required Information these should be accepted as a "Parties' pre-existing record".	TRAFFIC	Short-Term
12	Provide a better description of the ETIS subsidiary database, methods of data collection and the role that this database has had over time in particular in relation to the various ETIS reports. Publication of the database itself.	TRAFFIC	Short-Term
DATA VALIDATION			
13	Use the reliability of source score graded as C "Least degree of reliability" with cautions. Parties should be consulted before validating such data and including it in the analysis.	TRAFFIC	Short-Term
14	Enrich the description of the "Reliability of the Source" scores, clarify how grades A, B and C are assigned, and provide criteria used to determine whether a NGO or other source is 'reputable'.	TRAFFIC	Short-Term
15	The combination of "Reliability of the Source Score" and "Data Completeness Score" is described in the TRAFFIC SOPs manual with a 3x4 matrix. This review proposes a new version of the matrix (see Chapter 2).	TRAFFIC	Short-Term

[76] The Trade Chain Index is better explained in Chapter "Review of overall ETIS methodology, technical outputs and reports".

No	Recommendations	Who	Time frame
16	After consultation with TRAFFIC, it was noted that the "Status Categories" reported in the SOPs manual are not updated. It is recommended that TRAFFIC updates the Status Categories and the description of the new three categories -5, -4 and -3 in the SOPs manual.	TRAFFIC	Short-Term
17	Data validation rules need to be applied consistently.	TRAFFIC	Medium-Term
18	A detailed description of how the ETIS subsidiary database is validated must be developed.	TRAFFIC	Short-Term
DATA MANAGEMENT			
19	A clearly defined data management plan should be established. This explanation is already provided in TRAFFIC SOP manual but the related descriptions are out of date and need to be revised.	TRAFFIC	Short-Term
20	A data lifecycle control should be implemented.	TRAFFIC	Long-Term
21	Identify data owners and data stewards. This includes having an up do date list of focal points of CITES management authorities for the ETIS data and ensuring full access to the ETIS database by the CITES Secretariat.	TRAFFIC	Short-Term
22	Appropriate security protocols in place should be better described. To increase security, back-ups of ETIS databases should also be secured at the UNEP CITES Secretariat as this is not the case at present.	TRAFFIC	Short-Term
23	Proper documentation and tracking should be ensured as this is lacking in the current SOPs manual. Sound data management includes documenting workflows and tracking anomalies.	TRAFFIC	Short-Term
DATA ANALYSIS			
24	A full review of the ETIS code should be carried out. This would include streamlining some processes and scripts.	TRAFFIC	Long-Term
25	The theoretical framework of the ETIS methodology should be updated and clearly described in a single document before any changes are made to the R code.	TRAFFIC	Medium-Term
26	RMarkdown should be used to document the code. An RMarkdown is quite a technical instrument and it may be the case that only statisticians will be able to run it. It is therefore important to clarify whether the code's reproducibility is to be limited to statisticians only. CITES Parties should clarify which audience they would like to share the code with.	TRAFFIC	Medium for TRAFFIC/Short for CITES
27	Technical recommendations: i) Inconsistencies between scripts should be addressed.	TRAFFIC	Long-Term
	ii) Use functionals as an alternative to 'for loops' in the R code.	TRAFFIC	Medium-Term
	iii) The code published on GitHub shouldn't be customized for a specific ETIS report. Rather, it is recommended that the code accessible to Parties should include all the passages mentioned in the ETIS methodology.	TRAFFIC	Long-Term
	iv) The file published online on GitHub that explains to Parties how to run the scripts, should be revised, and explanations on how to run the following 10 scripts should be included: 1) df_ctry_add_fn.R, 2) df_quantities_rie_separate.R, 3) get subsid vars.R, 4) ggplot theme.R, 5) posterior distributions for lambda theta phi.R, 6) rhat functions.R, 7) select final data.R, 8) sql select countries oetd.R, 9) transaction index and plots.R, 10) weight index and plots.R. Although statisticians could determine how to run these scripts, it is important to document how to run each and every script used.	TRAFFIC	Short-Term
	v) Referring to columns by numbers should be avoided. The order of columns could change, and the R script would then be out of sync with the data.	TRAFFIC	Medium-Term
	vi) The use of T and F for TRUE and FALSE respectively should be avoided. R package conventions (and strong package checking) flag such usage as "non-conforming" because it is then too easy to accidentally create a variable T or F that is used in place of TRUE and FALSE.	TRAFFIC	Medium-Term
	vii) Explicit error messages should be given when things go wrong so that it is obvious to the person running the code that a problem exists.	TRAFFIC	Medium-Term
	viii) Assuming that data frames have rows in a particular order should be avoided. The use of cbind() should be avoided in favor of merge() when joining	TRAFFIC	Medium-Term

No	Recommendations	Who	Time frame
	two data frames. It is recommended to never refer to rows by row number but by selection criteria.		
	ix) Convert to simple plots in base R.	TRAFFIC	Medium-Term
	x) Use modern packages for data analysis	TRAFFIC	Medium-Term
DATA INTERPRETATION			
28	The method for assigning the percentages of seized ivory to the country of origin (50%-50% as in the example of chapter 5) should be clearly explained in the ETIS forms and in the ETIS methodology.	TRAFFIC	Short-Term
29	The ETIS data should be analyzed over the years using the same set of covariates otherwise results cannot be considered comparable/consistent. If covariates have to change for scientific purposes the limitations that this creates in terms of interpretation of data should be clearly explained.	TRAFFIC	Long-Term
30	Request information from Parties about how they determine the countries of origin for the seized ivory. It is recommended that Parties specify the method used to determine the country(ies) of origin.	TRAFFIC/ Parties	Short-Term
31	Reflect on the use of the CITES Reporting Score as a covariate to determine reporting rate. This proxy does not appear to be statistically robust.	TRAFFIC	Medium-Term
32	The definition of the Trade Chain Index, and in particular the definition of Destination Score, should be clarified (concepts of country listed and destination given). At the moment the model does not account for this limitation. It is recommended to revise this proxy to take into account this limitation.	TRAFFIC	Short-Term
33	Destination Score and Non-Destination Score have the similar concepts in common: it is suggested to use the term “provided” for both concepts to enhance consistency.	TRAFFIC	Short-Term
34	Parties must have an opportunity to engage the relevant DP on seizure records in which they are implicated before the data is used in the analysis.	TRAFFIC	Short-Term
35	The major concern with the ETIS model is the lack of identifiability of the underlying parameters which could arbitrarily be multiplied and divided by constants. It is recommended to take this limitation into account in the ETIS model.	TRAFFIC	Medium-Term
36	More quantitative elements relating to the illegal trade of ivory should be considered for inclusion in the methodology, as well as triangulation of data from various sources as an alternative to the use of proxies (Example of UNODC methodology).	TRAFFIC	Long-Term
37	The inputs of an expert in illegal trade in elephant specimens should be considered to enhance the interpretation of ETIS data and inform the further refinement of the methodology. The MIKE-ETIS Technical Advisory Group (TAG) should be strengthened to address this specific area and the addition of a global member with such expertise could add value.	TRAFFIC/ CITES	Medium Term
38	A more user-friendly, up-to-date and comprehensive document should be provided for the use of non-statisticians for them to fully understand the methodology. This should be provided along with trainings.	TRAFFIC	Short-Term
REVIEW OF OVERALL ETIS METHODOLOGY, TECHNICAL OUTPUTS AND REPORTS			
39	A more technical document and related training should be provided to the CITES Secretariat that is responsible to introduce the TRAFFIC reports to Parties and to interested Parties.	TRAFFIC	Short-Term
40	The ETIS methodology, as all mathematical and statistical methodologies, has some limitations. It is recommended that the following limitations are explained in the methodology document: -The implications of making assumptions and in particular assuming that the data are biased. -Limitations when data are not given or availed, and hence need to be estimated, e.g. in the case of ivory weights. -The implications of using covariates and the effect of each covariate. -Difference between relative and absolute values.	TRAFFIC	Short-Term

No	Recommendations	Who	Time frame
41	Although any statistical model has its own limitations, internal coherence should be respected and when not, it should be explained why. It is not clear why the Trend analysis and the Cluster analysis are based on bias-adjusted data, but then the determination of the categories considered in the NIAP process is informed by non-bias-adjusted data. The reasons behind this choice should be explained.	TRAFFIC	Short-Term
42	Provide documentation on the sensitivity analysis that assesses the quality of the cluster analysis and that is reported to show "very high degree of cohesiveness".	TRAFFIC	Short-Term
43	It is important to note that the countries that now enter into the ETIS analysis are countries that score at least 100 after having reported seizures or having been implicated by other countries that made seizures. It is recommended that the ETIS methodology takes into account a process to verify this data.	TRAFFIC	Short-Term
44	Additional sources of factual data should either substitute or complement qualitative indicators when determining the NIAP categories.	TRAFFIC	Short-Term
45	Provide both practical calculations done in R, and theorical explanations associated with the interpolation done when covariate data is not available.	TRAFFIC	Short-Term
46	An explanation should be provided about the changes made to the Data Collection Effort Score and an indication to which category the data classified as "routine" were assigned.	TRAFFIC	Short-Term
47	It is recommended to compare data that come from the same methodology and hence the same covariates otherwise the limitations / assumptions associated with this choice should be better explained.	TRAFFIC	Short-Term
48	It should be made very clear to Parties that the ETIS analysis is not built on the exact seizure record data Parties submit but that the data are processed, bias-adjusted with the application of covariates and then used in the ETIS analysis.	TRAFFIC	Short-Term
49	The variable "Mean Market Score" appears for the first time in the reports to CoPs and it is not clear why this variable is used to inform the determination of the categorization of Parties given that the data collected are not homogeneous on domestic illegal trade. The meaning of the variable called "Measure of Domestic Ivory Trade" should be explained to Parties and its limitations noted in the ETIS methodology considering that data on domestic illegal trade are not collected homogeneous or in a standardized manner (as is the case with seizure records).	TRAFFIC	Short-Term
50	Cluster analysis: It is not clear what the similar characteristics are that TRAFFIC takes into account to group countries into clusters. Additionally, "Most prominently implicated" is a terminology used by TRAFFIC in their ETIS report (reference is made to CoP18) when describing the results of the cluster analysis. The cluster analysis is more of a descriptive or exploratory analysis and not an inferential one. Thus, the idea that it's used to implicate countries seems potentially problematic. Additionally, TRAFFIC does not specify what metric was used to measure "distance" between countries. All these points should be clarified.	TRAFFIC	Short-Term

Annex A - Errors in the R code published on GitHub

A short summary of the errors encountered in the code published on GitHub:

- *Minor problems:* These include mistakes in the specifications of the name of the CSV files to be used by the scripts. The different scripts are to be run one after the other, and the CSVs are produced at the end of each script. At this point the subsequent script uses the CSV produced in the previous script. For this reason, the name of script should be recorded correctly almost automatically but this was not the case.
- *Most common problem*: The packages that the code requires to download are, most of the time, conflicting with each other. Some R functions (one example of the many is "select") conflict with similarly named functions in other packages. The code needs to be modified by adding the package origin (e.g., "dplr::") in front of the function name. For other functions like "mutate" a new line, with a new code, is re-written as reported in the screenshots of Annex1.
- The scripts are not self-contained. For example, specifications of which version of Java should be installed was missing. Before finding the correct version of Java, different trials were performed which resulted in a time-consuming attempt to run the code. The same happened with the missing specification for downloading some of the R packages.
- The CVS file of the weight estimation carried out in CoP 18 was provided to the consultant only in January 2021[77]
- The script "*wgt est model comparison.R*" mentioned on page 11 of the TRAFFIC publication "Revision of ETIS Standard Operating Procedures", published in February 2020, is missing from GitHub.
- No explanation in any of the supporting documents was provided on how to run the following 3 scripts: *df_ctry_add_fn.R, ggplot theme.R, weight index and plots.R*. Although a solution can be found by statisticians, for the purpose of completeness, each script should be described and explained.
- Most of the statistical operations carried out in the scripts are not explained. A good practice to make the code usable and understandable for other users and analysts is to comment on each passage.
- The errors encountered in the code have been solved and now analysis can be performed without experiencing the problems described above. The R code was assumed to be ready in order to review the analysis that is meant to produce. Instead, an analysis of the code itself was necessary[78].

The details relating to the errors encountered in the code version published on GitHub are provided below. The screenshots show the problems and how they have been resolved.

Note to the readers: Please note that, one of the products of this review, is an improved version of the R code where all the errors have been resolved and now analysis can be smoothly run. Calculations, formulas and methodology are the same. What has changed concerns technical issues of the execution of the code.

Wgt est models development.R

[77] The importance of using the same weights is explained in the chapter "Review of overall ETIS methodology, technical outputs and reports". The weights have been re-estimated without having the possibility of using the ones used for CoP18. The database that TRAFFIC provided for the purpose of this review was the database used for the 2020 analysis. It was therefore difficult to estimate exactly the same weights used in COP18. It was not possible to compare the weights estimated for the purpose of this review with the actual weights used for COP18.

[78] To clarify the difference between revising the analysis produced by the code versus revising the code itself the example of the SOPs can be made. The reviewers were supposed to analyze what the SOPs say and not to revise the SOPs themselves. The SOPs are however not updated and analyze what they say is difficult but this doesn't mean that the consultants should re-write the SOPs. Similarly, the code is supposed to create analysis by simply running it. Unfortunately, some parts of the code itself need to be rewritten, otherwise, it is difficult to obtain the analysis and this is what the statistical consultant of this review has done up till the script 17. For the SOPs, no SOPs were re-written. Instead, it was underlined that many parts need to be updated as they are conflicting with each other. TRAFFIC has provided an updated version of certain paragraphs.

```r
setwd(path.wkg)
#df.szrecs <- read.csv('ivory sz recs 1900_2100.csv', header=T)
#Revision: Daniela Di Filippo: the name of the file was not written correctly so the code could not run
df.szrecs <- read.csv('ivory sz recs 1900_2100_tidy.csv', header=T)
```

```r
df.wkd <- df.szrecs %>%
  filter(wkd) %>%
  #select(sz.id, sz.yr, disc.ct, wkd.pcs, wkd.wgt)
  #Revision: Daniela Di Filippo
  #there is another package attached that also has a select function and R
  #thinks we are calling that. This is called masking and indeed there a warning
  #when loading the packages. for this reason is best to use the following code:
  dplyr::select(sz.id, sz.yr, disc.ct, wkd.pcs, wkd.wgt)
```

```r
df.raw <- df.szrecs %>%
  filter(raw) %>%
  #select(sz.id:raw.wgt)
#Revision: Daniela Di Filippo
  #there is another package attached that also has a select function and R
  #thinks we are calling that. This is called masking and indeed there a warning
  #when loading the packages. for this reason is best to use the following code:
  dplyr::select(sz.id:raw.wgt)
```

```
> library(MASS)
> library(tidyverse)
── Attaching packages ─────────────────────────────────────── tidyverse 1.3.0 ──
✓ ggplot2 3.3.2     ✓ purrr   0.3.4
✓ tibble  3.0.3     ✓ dplyr   1.0.2
✓ tidyr   1.1.2     ✓ stringr 1.4.0
✓ readr   1.3.1     ✓ forcats 0.5.0
── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ──
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
x dplyr::select() masks MASS::select()
> library(mgcv)
Loading required package: nlme

Attaching package: 'nlme'

The following object is masked from 'package:dplyr':

    collapse

This is mgcv 1.8-31. For overview type 'help("mgcv-package")'.
```

Wgt est models.R

```r
setwd(path.wkg)
#Revision: Daniela Di Filippo
#The name of the file is not correct
#df.szrecs <- read.csv('ivory sz recs 1900_2100.csv', header=T)
df.szrecs <- read.csv('ivory sz recs 1900_2100_tidy.csv', header=T)
```

```r
df.wkd <- df.szrecs %>%
  filter(wkd) %>%
  #Revision: Daniela Di Filippo
  #select(sz.id, sz.yr, disc.ct, wkd.pcs, wkd.wgt)
  #There is another package attached that also has a select function and R
  #thinks we are calling that. This is called masking and indeed there is a warning
  #when loading the packages. For this reason is best to use the following code:
  dplyr::select(sz.id, sz.yr, disc.ct, wkd.pcs, wkd.wgt)
```

Wgt est.R

```r
df.raw <- df.szrecs %>%
  filter(raw) %>%
  #select(sz.id:raw.wgt)
  #Revision:Daniela Di Filippo
  #There is another package attached that also has a select function and R
  #thinks we are calling that. This is called masking and indeed there is a warning
  #when loading the packages. For this reason is best to use the following code:
  dplyr::select(sz.id:raw.wgt)

names(df.raw)[4:5] <- c('pcs', 'wgt')

df.wkd <- df.szrecs %>%
  filter(wkd) %>%
  #Revision:Daniela Di Filippo
  #select(sz.id, sz.yr, disc.ct, wkd.pcs, wkd.wgt)
  #There is another package attached that also has a select function and R
  #thinks we are calling that. This is called masking and indeed there is a warning
  #when loading the packages. For this reason is best to use the following code:
  dplyr::select(sz.id, sz.yr, disc.ct, wkd.pcs, wkd.wgt)
```

```r
df.r.pred <- df.raw %>%
  filter(!is.na(pcs) & is.na(wgt)) %>%
  #Revision: Daniela Di Filippo
  #select(sz.id, sz.yr, pcs, wgt, x)
  #There is another package attached that also has a select function and R
  #thinks we are calling that. This is called masking and indeed there is a warning
  #when loading the packages. For this reason is best to use the following code:
  dplyr::select(sz.id, sz.yr, pcs, wgt, x)
```

```r
df.w.pred <- df.wkd %>%
  filter(!is.na(pcs) & is.na(wgt)) %>%
  #Revision: Daniela Di Filippo
  #select(sz.id, sz.yr, pcs, wgt, x)
  #There is another package attached that also has a select function and R
  #thinks we are calling that. This is called masking and indeed there is a warning
  #when loading the packages. For this reason is best to use the following code:
  dplyr::select(sz.id, sz.yr, pcs, wgt, x)
```

Sz dataset_ALL gps.R

```r
# get sz records with est'd wgts
#Daniela Di Filippo
#The name of the file was not correctly specified so R could not open it
#df.szrecs <- read.csv(paste('sz recs with estd wgts ', year.from, '_', year.to, '_tidy.csv', sep = ''), header = T)
df.szrecs <- read.csv(paste('sz recs with estd wgts ', year.from, '_', year.to, '.csv', sep = ''), header = T)
```

```
> df.raw <- df.szrecs %>%
+ filter(raw) %>%
+ select(sz.id = sz.id, sz.yr = sz.yr, ctry = disc.ct,
+ pcs = raw.pcs, wgt = raw.wgt, lo.cl = raw_l, up.cl = raw_u, grp = raw.grp) %>%
+ mutate(grp = reorder(grp, new.order = c(1, 2, 3, 5, 4, 6)))
Error: Problem with `mutate()` input `grp`.
x argument "X" is missing, with no default
i Input `grp` is `reorder(grp, new.order = c(1, 2, 3, 5, 4, 6))`.
Run `rlang::last_error()` to see where the error occurred.
```

```
#Revision: Daniela Di Filippo
#Mutate line does not work due to package incompatibility.
#Maybe this code was written long time ago or there are new updates on the packages.
#It does not work somehow.
#The old code is a comment. The new code is provided.
#df.raw <- df.szrecs %>%
#filter(raw) %>%
#select(sz.id = sz.id, sz.yr = sz.yr, ctry = disc.ct,
#pcs = raw.pcs, wgt = raw.wgt, lo.cl = raw_l, up.cl = raw_u, grp = raw.grp) %>%
#mutate(grp = reorder(grp, new.order = c(1, 2, 3, 5, 4, 6)))
df.raw <- df.szrecs %>%
  filter(raw) %>%
  select(sz.id = sz.id, sz.yr = sz.yr, ctry = disc.ct,
         pcs = raw.pcs, wgt = raw.wgt, lo.cl = raw_l, up.cl = raw_u, grp = raw.grp) %>%
  mutate(grp = factor(grp))%>%
  arrange(grp)
```

```
> df.wkd <- df.szrecs %>%
+   filter(wkd) %>%
+   select(sz.id = sz.id, sz.yr = sz.yr, ctry = disc.ct,
+          pcs = wkd.pcs, wgt = wkd.wgt, lo.cl = wkd_l, up.cl = wkd_u, grp = wkd.grp) %>%
+   mutate(grp = reorder(grp, new.order = c(1, 2, 3, 5, 4, 6)))
Error: Problem with `mutate()` input `grp`.
x argument "X" is missing, with no default
i Input `grp` is `reorder(grp, new.order = c(1, 2, 3, 5, 4, 6))`.
Run `rlang::last_error()` to see where the error occurred.
```

```
#Revision: Daniela Di Filippo. Here again happens the same thing like above
# The old code is a comment and the new code is provided.
#df.wkd <- df.szrecs %>%
#  filter(wkd) %>%
#  select(sz.id = sz.id, sz.yr = sz.yr, ctry = disc.ct,
#         pcs = wkd.pcs, wgt = wkd.wgt, lo.cl = wkd_l, up.cl = wkd_u, grp = wkd.grp) %>%
#  mutate(grp = reorder(grp, new.order = c(1, 2, 3, 5, 4, 6)))

df.wkd <- df.szrecs %>%
  filter(wkd) %>%
  select(sz.id = sz.id, sz.yr = sz.yr, ctry = disc.ct,
         pcs = wkd.pcs, wgt = wkd.wgt, lo.cl = wkd_l, up.cl = wkd_u, grp = wkd.grp) %>%
  mutate(grp = factor(grp))%>%
  arrange(grp)
```

Covar setup.R

```
#Revision: Daniela Di Filippo. As indicated in the introductory notes of this script,
#before starting to run this code, it is important to install the RPostgreSQL
#The command for the installation was missing
install.packages("RPostgreSQL")
```

Trade Route Calculation.R

```
#Revision: Daniela Di Filippo, the following file is not recognized because the name _tidy is
#wrongly specified and should be removed
#Now only select countries to be used in the ETIS analysis
#ctry.use <- read.csv('CTS_ALL_17072018_tidy.csv')
ctry.use <- read.csv('CTS_ALL_17072018.csv')
```

```
> iv.rte.yr.un.df <- expand.grid(ctry = ctry.name, year = year.from:year.to)
> iv.rte.yr.un.df <- iv.rte.yr.un.df %>%
+   mutate(
+          log.iv.rte2 = as.numeric(log.iv.rte2.yr.un)
+   )
Error: Problem with `mutate()` input `log.iv.rte2`.
x object 'log.iv.rte2.yr.un' not found
i Input `log.iv.rte2` is `as.numeric(log.iv.rte2.yr.un)`.
Run `rlang::last_error()` to see where the error occurred.
```

```
#Revision: Daniela Di Filippo. Like in script "sz dataset_ALL gps.R" mutate command is not running.
#The old code is a comment and the new code is provided.
iv.rte.yr.un.df <- expand.grid(ctry = ctry.name, year = year.from:year.to)
iv.rte.yr.un.df <- iv.rte.yr.un.df %>%
#  mutate(
#         log.iv.rte2 = as.numeric(log.iv.rte2.yr.un)
#  )
 log.iv.rte2=log.iv.rte2.yr.un %>%
 mutate_at(vars(log.iv.rte2),numeric)
```

Select final data.R

```
#Revision: Daniela Di Filippo. This script is using the output csv file created from the scritp
#"trade route calculation" which reports the years 2008-2017 therefore the command below sholuld
#be changed from -1 to +1
file.add.covars <- paste('Trade Route Ctry_Year un disc_TRUE_',
#                        year.from-1, '_', year.to, '.csv', sep = '')
                         year.from+1, '_', year.to, '.csv', sep = '')
```

Sz_JAGS model Final.R

```
#   Java (for XLConnect) need to be installed.
#Comment: Daniela Di Filippo. Very important: Java version must be between Java>=8 and <=11 otherwise the script
#will not run
```

```
#=============================================================================
#Comment:Daniela Di Filippo.
#Before running this scrip it is essential installing the following packages
#and to install JAGS on the computer
install.packages('XLConnect')
install.packages('jagsUI')
install.packages('coda')
install.packages('mcmcplots')
install.packages('tidyverse')
install.packages("rJava")
install.packages("dplyr")
```

```
> n.ctry <- nlevels(df.szs$ctry)
> ctry.lab <- levels(df.szs$ctry)
> int.log <- slop.log <-  matrix(nrow = n.ctry, ncol = 5, data = 0)
> for (i in 1:n.ctry){
+   subs.log <- filter(df.szs.log, ctry == ctry.lab[i])
+   for (k in 1:5){
+     lm.subs.log <- lm(subs.log[,(k + 2)] ~ subs.log$poly.yr)
+     int.log[i, k] <- lm.subs.log$coefficients[1]
+     slop.log[i, k] <- lm.subs.log$coefficients[2]
+   }
+ }
Error: Problem with `filter()` input `..1`.
x Input `..1` must be of size 657 or 1, not size 0.
i Input `..1` is `ctry == ctry.lab[i]`.
Run `rlang::last_error()` to see where the error occurred.
```

```
153 #Revision: Daniela Di Filippo the variables must be converted into factors
154 #n.ctry <- nlevels(df.szs$ctry)
155 #ctry.lab <- levels(df.szs$ctry)
156 n.ctry <- nlevels(as.factor(df.szs$ctry))
157 ctry.lab <- levels(as.factor(df.szs$ctry))
158 int.log <- slop.log <-  matrix(nrow = n.ctry, ncol = 5, data = 0)
159 for (i in 1:n.ctry){
160   subs.log <- filter(df.szs.log, ctry == ctry.lab[i])
161   for (k in 1:5){
162     lm.subs.log <- lm(subs.log[,(k + 2)] ~ subs.log$poly.yr)
163     int.log[i, k] <- lm.subs.log$coefficients[1]
164     slop.log[i, k] <- lm.subs.log$coefficients[2]
165   }
166 }
```

```
> cov.int.log <- cov(int.log)
> cov.slop.log <- cov(slop.log)
> basis.dat <-
+   list(N      = dim(df.szs)[1],
+        N.c    = n.ctry,
+        n.sz   = as.matrix(df.szs[,3:7]),
+        ctry   = as.numeric(df.szs$ctry),
+        Y.1    = Y.p[,1],
+        Y.2    = Y.p[,2],
+        Y.3    = Y.p[,3],
+        Y.4    = Y.p[,4],
+        LE1    = zsc.fn(df.covars$LE1),
+        dc     = zsc.fn(dc),
+        log.tr.ch2 =  zsc.fn(df.covars$log.iv.tr.ch2),
+        rep.l  = zsc.fn(df.covars$rep.log),
+        R0     = diag(round(diag(cov.int.log), 1)),
+        R1     = diag(round(diag(cov.slop.log))),
+        mn     = c(0,0,0,0,0),
+        prec   = diag(0.0001,5,5)
+ )
Warning messages:
1: NAs introduced by coercion
2: In mean.default(x) : argument is not numeric or logical: returning NA
```

```
+                n.chains = 2,
+                n.adapt = 50000,
+                n.iter = 200000,
+                n.burnin = 100000,
+                n.thin = 10,
+                seed = 15)

Processing function input.......

Done.

During startup - Warning messages:
1: Setting LC_COLLATE failed, using "C"
2: Setting LC_TIME failed, using "C"
3: Setting LC_MESSAGES failed, using "C"
4: Setting LC_MONETARY failed, using "C"
During startup - Warning messages:
1: Setting LC_COLLATE failed, using "C"
2: Setting LC_TIME failed, using "C"
3: Setting LC_MESSAGES failed, using "C"
4: Setting LC_MONETARY failed, using "C"
Beginning parallel processing using 2 cores. Console output will be suppressed.
Error in checkForRemoteErrors(val) :
  2 nodes produced errors; first error: RUNTIME ERROR:
Compilation error on line 10.
Unknown variable log.tr.ch2
Either supply values for this variable with the data
or define it  on the left hand side of a relation.

In addition: Warning message:
In gen.inits(inits, n.chains, seed, parallel) :
  The 'seed' argument will be deprecated in the next version. You can set it yourself wit
h set.seed() instead.
```

Annex B - Proposed Amendments to Annex 1 to Resolution Conf. 10.10 (Rev.CoP18)

Note to reader: text proposed to be deleted is ~~crossed out~~. Proposed new text is underlined.

Annex 1 **Monitoring illegal trade in ivory and other elephant specimens**

1. Introduction

In order to monitor and record levels of illegal trade in ivory and other elephant specimens on a global basis, there is a need for a system to collect and compile law enforcement data on seizures and confiscations. At its 10th meeting, the Conference of the Parties, in 1992, recognized the Bad Ivory Database System (BIDS) established by TRAFFIC for this purpose.

Through further development and refinement, BIDS evolved into the Elephant Trade Information System (ETIS) which has been used to monitor the pattern and scale of illegal trade in ivory and other elephant specimens since 1998.

2. Data scope

ETIS is a comprehensive and global information system whose central feature is a database holding the details of law enforcement records for seizures or confiscations of elephant ivory and other elephant specimens which have been reported to occur since 1989. ETIS also maintains a series of subsidiary information on law enforcement effort and efficiency, rates of reporting, legal and illegal elephant product markets, governance issues, background economic data, derived measures, and other factors to enable the statistical analysis and its interpretation.

The following data on domestic and international seizures of illegal trade in elephant ivory and other elephant specimens are collected by TRAFFIC in collaboration with the CITES Secretariat (minimum information required to enable data entry of a seizure case into ETIS denoted by an asterisk):

- source of information*
- date of seizure (at least the year)*
- agency responsible for seizure*
- type of transaction
- location of discovery (at least the country)*
- country of origin
- country of export
- country of transit
- country of destination/import
- Ivory type (whether the ivory is raw, worked or semi-worked should be indicated) weight and number of pieces (whether the number of pieces and their weight is estimated or official should be indicated). An effort should be made to report both weight and number of pieces although seizure can be retained, for ETIS analysis, even if there is only one of the two information*
- Non ivory specimens (Elephant hide/skin, Manufactured hide products and Other elephant products) weight and number of pieces (whether the number of pieces and their weight is estimated or official should be reported). Both number of pieces and weight should be reported although seizure can be retained, for ETIS analysis, even if there is only one of the two information*
- mode of transport
- modus operandi
- indicate if the seizure is national or international
- ~~nationality of suspects~~

Upon consultation with the MIKE and ETIS Technical Advisory Group (TAG), the above list of MED as well as subsidiary information will be updated as additional data elements are deemed necessary to improve the analytics and the resulting output and interpretation. Parties will be informed about the additional data elements to be added through a Notification.

3. ~~Methods~~ Data governance

~~Data and information on illegal trade in elephant ivory and other elephant specimens will be collected by TRAFFIC in collaboration with the CITES Secretariat. In this regard, a standardized methodology has been developed for the collection of data, including, inter alia and to the extent known:~~

~~Standardized data are collected through a number of mechanisms and formats, including direct online data submission to the ETIS website, using the ETIS Data Collection Form for individual seizure cases or the ETIS Data Collection Spreadsheet for reporting multiple seizure cases at one time. Reporting on elephant product seizures or confiscations using other formats is also acceptable.~~

Data ownership:

The detailed data on individual seizure cases and law enforcement submitted via ETIS are owned by the respective CITES Parties. Each Party has data ownership accountability over the data submitted by them. The CITES Secretariat has data ownership accountability for all other derived data/information/measures via ETIS. Data owners are accountable for the quality and integrity of their own data; however, the day-to-day data management activities may be delegated to the Data Stewards.

Data stewardship:

Data Stewardship is the management of data and information, including content and metadata, on behalf of the data owners to ensure high quality data, required controls and data integrity in accordance with the Data Scope. The CITES Secretariat is the primary Data Steward of all ETIS data, however, all data management responsibilities are delegated to TRAFFIC who will be responsible for definition and management of the ETIS data lifecycle and data governance with CITES Secretariat consultation.

Oversight and accountability:

Roles, responsibilities and accountability for data owners and stewards will be identified for all ETIS data with transparent and effective communication on all matters relating to data controls and governance being made available on the ETIS Online system as well as the CITES website.

4. Data collection and compilation

The MIKE and ETIS Technical Advisory Group (TAG) will support the development and implementation of ETIS. ETIS will be managed and coordinated by TRAFFIC in consultation with the TAG and in collaboration with the CITES Secretariat.

All Parties, through their CITES Management Authorities, following liaisons with appropriate law enforcement agencies, should provide information on seizures and confiscations of ivory or other elephant specimens in the prescribed formats, either to the Secretariat or directly to TRAFFIC within 90 days of their occurrence. In addition, law enforcement agencies in States not-party to the Convention are requested to provide similar information.

TRAFFIC will assist the Parties in collecting data, ensuring data quality and consistency, and providing tools and training in data collection, data utilization and information management to designated officials around the world as appropriate.

Standardized data will be collected through several mechanisms and formats, including direct online data submission to the ETIS website, using the ETIS Data Collection Form for individual seizure cases or the ETIS Data Collection Spreadsheet for reporting multiple seizure is acceptable as long as it contains the Minimum Required Information.

5. Information, data analysis and interpretation

Information generated by ETIS is hereby defined as the outcomes and outputs of ETIS data analysis, including summaries and aggregates in different forms, trends and other analytical presentations, and the relationships and factors which comprise underlying trade dynamics.

The analysis and interpretation of data will be coordinated by TRAFFIC in association with the CITES Secretariat and MIKE (see Annex 2), and in consultation with the relevant Parties and the TAG. The statistical methodology, underlying code, and supporting documentation will be published and made available to all Parties. Moreover, the statistical modelling and techniques will be reviewed and refined as deemed necessary by the TAG and TRAFFIC and submitted to the MIKE-ETIS Subgroup of the Standing Committee for consideration.

6. Intersessional Remedial Action

In the event that there is a need for urgent intersessional action, TRAFFIC will report as appropriate to the Standing Committee via the Secretariat.

7. Funding

A funding mechanism will be established to ensure that ETIS ~~is fully operational~~ can meet minimum operational requirements.

Annex C – Consultants' Terms of Reference

Job Opening number(s):	20-United Nations Environment Programme-134329-Consultant 20-United Nations Environment Programme-134330-Consultant
Job Title(s):	Governance and Business Process Specialist Data Management and Statistical Analysis Specialist
General Expertise:	Management and Analysis
Category:	Programme Management
Department/ Office:	United Nations Environment Programme
Organizational Unit:	UNEP ODED CITES

Duties and Responsibilities

The United Nations Environment Programme (UN Environment) is the leading global environmental authority that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and serves as an authoritative advocate for the global environment. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between States. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival (www.cites.org). The CITES Secretariat is administered by UN Environment and is located in Geneva duty station.

The Elephant Trade Information System (ETIS) was established through the adoption by the Parties of Resolution Conf. 10.10 on Trade in elephant specimens at the 10th meeting of the Conference of the Parties (CoP10, 1997, Harare). Among others, Resolution Conf. 10.10 called for the establishment, under the supervision and direction of the Standing Committee, of a comprehensive international system to monitor the illegal trade in elephant specimens. Initially, an existing database of ivory seizure information, TRAFFIC's Bad Ivory Database System (BIDS), was designated as the appropriate instrument for these purposes.

To serve the needs of the CITES Parties more effectively, and through a consultative process involving a number of technical experts worldwide, BIDS eventually evolved into ETIS, a far more sophisticated monitoring tool. ETIS is a comprehensive information system to track illegal trade in ivory and other elephant specimens. Its objectives are to record and analyse levels and trends in illegal trade, assess whether and to what extent observed trends are related to measures concerning elephants and trade in elephant specimens taken under the auspices of CITES; establish an information base to support the making of decisions on appropriate management, protection and enforcement needs; and build capacity in elephant range States and, as applicable, countries involved in trade in elephant specimens. The central component of ETIS is a database on records of seizures of elephant specimens (mainly ivory) that have occurred anywhere in the world since 1989. The seizure database is supported by a series of subsidiary databases that score law enforcement effort and efficiency, rates of reporting, and domestic ivory markets.

Since its inception, ETIS has been managed by TRAFFIC on behalf of the CITES Parties. This work has been led by the TRAFFIC office in Harare, Zimbabwe. The Secretariat is mandated to report on information and analysis provided by ETIS at each meeting of the Conference of the Parties and, subject to the availability of adequate new ETIS data, at relevant meetings of the Standing Committee. TRAFFIC therefore produces a comprehensive analytical report of the ETIS data assessing the factors addressed in the above objectives prior to each meeting of the Conference of the Parties. To ensure that there are sufficient data from which to assess illegal trade, the provisions of Annex 1 to Resolution Conf. 10.10 (Rev. CoP18) as agreed by the Conference of the Parties to CITES states that all Parties should communicate information on elephant ivory and other elephant product seizures to the CITES Secretariat or directly to TRAFFIC within 90 days of their occurrence. While Parties often do not strictly apply this timeframe, it is worth noting that the seizure database has nonetheless grown from around 4,000 records in 1997 to nearly 30,000 records in January 2020.

The CITES Standing Committee provides policy guidance to the Secretariat concerning the implementation of the Convention and among others it coordinates and oversees, where required, the work of other committees and working group and carries out tasks given to it by the Conference of the Parties. At its 70th meeting in October 2018 (Russian Federation) the Standing Committee adopted Terms of Reference for the review of the ETIS programme. At the 18th meeting of the Conference of Parties (CoP) to CITES, the CoP adopted Decision 18.18 on the review of the ETIS programme that directs the CITES Secretariat to include in the terms of reference for the review of the Elephant Trade Information System (ETIS) programme the issue of overlapping reporting requirements created under Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens and Resolution Conf. 11.17 (Rev. CoP18) on National reports and the challenges posed by the different data-sharing policies, and work closely with the consultants carrying out the review to identify possible solutions.

Two consultants will be appointed to assist with the review, i.e. Governance and Business Process Specialist and a Statistician. The two consultants will collaborate and prepare a consolidated report that covers the governance, process and statistical matters to be addressed in the review.

These terms of reference cover the part of the review to be done by the Governance and Business Process specialist and Data Management and Statistical Analysis Specialist

Duties and Responsibilities for the Governance and Business Process Specialist:

The Governance and Business Process Specialist, in collaboration with the Statistician to be appointed, will be responsible to conduct a review of the ETIS programme to ensure that (a) ETIS is operating in an appropriate, transparent and accountable manner; (b) CITES Parties are engaged as appropriate; and
(c) ETIS produces scientifically robust analyses to be used in CITES decision making processes in accordance with the provisions in Resolution Conf. 10.10 (Rev. CoP18). Based on the review findings, recommendations should be formulated to (i) further strengthen the methodology used throughout the ETIS process (if required); (ii) address the institutional arrangements and resources needed to implement any proposed recommendations to amend the ETIS methodology or Resolution Conf. 10.10 (Rev. CoP18) and (iii) deal with the institutional arrangements and resources needed to adequately meet the objectives of ETIS and ensure its longer-term sustainability.

The following tasks must be completed:
A) Review the provisions in Annex 1 (Monitoring illegal trade in ivory and other elephant specimens) of Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens, with special reference to sections 2 (Scope), 3 (Methods), 4 (Data collection and compilation) and 5 (Information, data analysis and interpretation), to determine

i) whether these provisions and their implementation are adequate to meet the objectives of ETIS, as set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18), and are sufficiently robust, transparent and scientifically justifiable.
ii) whether the following processes used by TRAFFIC are adequately described in Annex 1 to Resolution Conf. 10.10 (Rev. CoP18), and sufficiently contribute to achieving the objectives of ETIS:
• data collection
• data validation with Parties
• data dissemination
• reporting the results of the analysis to Parties and the CITES Secretariat.
iii) whether there is a need to amend Annex 1 in Resolution Conf. 10.10 (Rev. CoP18) and if so, propose amendments as required.
iv) whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan process as outlined in Annex 3 to Resolution Conf. 10.10 (Rev. CoP18)].

B) Review the current institutional arrangements and resources available to meet the objectives of ETIS as set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18) and with special reference to Annex 1, section 7, and make recommendations to:
i) implement any proposed recommendations to amend the current ETIS methodology or Resolution Conf. 10.10 (Rev. CoP18);
ii) address possible challenges and the programmes' longer-term sustainability.

C) Assess the reporting requirements created under Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens and Resolution Conf. 11.17 (Rev. CoP18) on National reports, and make recommendations to address:
i) the issue of overlapping reporting requirements; and
ii) the challenges posed by the different data-sharing policies

In undertaking the review indicated above, due consideration should be given to among others:
a) the context within which ETIS was developed and how the ETIS analysis is currently used in CITES processes and decision making;
b) the institutional arrangements, operations and ability to meet the objectives of ETIS set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18);
c) the issues raised by Parties in relation to the ETIS methodology and analysis (to be provided by the CITES Secretariat);
d) the submissions received from Parties concerning the ETIS methodology, in accordance with paragraph 158 v) of document SC69 Doc. 29.3 and submissions received by the Secretariat on or before 28 February 2019 (to be provided by the CITES Secretariat);
e) ETIS reports submitted for consideration by the Conference of Parties, including documents CoP17 Doc. 57.6 (Rev. 1) and CoP16 Doc. 53.2.2 (Rev. 1);
f) information provided by the MIKE-ETIS Technical Advisory Group relating to the ETIS analysis (including Information documents CoP17 Inf. 67 and SC69 Inf. 22);

g) Peer-reviewed scientific publications relating to the ETIS analyses, including: Underwood, F.M., Burn, R.W., Milliken, T. (2013). Dissecting the illegal ivory trade: an analysis of ivory seizures data. PLoS One 8(10): e76539; and Burn, R.W., Underwood, F.M. (2012). A new statistical modelling framework to interpret ivory seizures data: A technical report describing the new modelling framework for analysing seizures data from the Elephant Trade Information System. Mathematics Report series (1/2013), Department of Mathematics and Statistics, University of Reading, UK;

h) the existing databases and standard operating procedures used in the ETIS analysis; and
i) other relevant scientific literature and studies on the statistical analysis of:
a. data relating to illegal trade in elephant specimens; and
b. illegal wildlife trade data; and
c. other illicit trade data.

The Governance and Business Processes Specialist and Statistician (the consultants) will work with a nominated focal point from the CITES Secretariat (CITES MIKE Coordinator) and oversight will be provided by the MIKE and ETIS Subgroup of the CITES Standing Committee. In addition, the consultants will consult with Parties, TRAFFIC, the statisticians involved in the development of the statistical analysis for ETIS and responsible for the ETIS analysis, the MIKE and ETIS Technical Advisory Group members, and other stakeholders, as appropriate. The CITES MIKE Coordinator will provide assistance to the consultants to facilitate the consultation process. The consultation process should include sharing the progress report, preliminary findings and the final report with Parties, TRAFFIC and the statisticians involved in the development of the statistical analysis for ETIS and responsible for the ETIS analysis.

Duties and Responsibilities for the Data Management and Statistical Analysis Specialist:

The Statistician, in collaboration with the Governance and Business Process Specialist to be appointed, will be responsible to conduct a review of the ETIS programme to ensure that ETIS produces scientifically robust analyses to be used in CITES decision making processes in accordance with the provisions in Resolution Conf. 10.10 (Rev. CoP18). Based on the review findings, recommendations should be formulated to address any problems identified to and to further strengthen the methodology used in the ETIS process and analysis.

The following tasks must be completed:

A) Review the provisions in Annex 1 (Monitoring illegal trade in ivory and other elephant specimens) of Resolution Conf. 10.10 (Rev. CoP17) on Trade in elephant specimens, with special reference to sections 2 (Scope), 3 (Methods), 4 (Data collection and compilation) and 5 (Information, data analysis and interpretation), to determine
i) whether the following processes used by TRAFFIC are adequately described in Annex 1 to Resolution Conf. 10.10 (Rev. CoP17), and sufficiently contribute to achieving the objectives of ETIS:
• data collection
• data validation
• data management
• data analysis (including the code / algorithm used for the analysis)
• data interpretation
• review of analysis
• technical outputs and reports.
ii) whether there is a need to amend Annex 1 in Resolution Conf. 10.10 (Rev. CoP18) and if so, propose amendments as required.
iii) whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan process as outlined in Annex 3 to Resolution Conf. 10.10 (Rev. CoP18)].

B) Prepare a report outlining the findings of the review and recommendations relating to possible changes to the Resolution and ETIS processes and analysis.

In undertaking the review indicated above, due consideration should be given to, among others:
i) the issues raised by Parties in relation to the ETIS methodology and analysis (to be provided by the CITES Secretariat);
ii) the submissions received from Parties concerning the ETIS methodology, in accordance with paragraph 158 v) of document SC69 Doc. 29.3 and submissions received by the Secretariat on or before 28 February 2019 (to be provided by the CITES Secretariat);
iii) ETIS reports submitted for consideration by the Conference of Parties, including documents CoP17 Doc. 57.6 (Rev. 1) and CoP16 Doc. 53.2.2 (Rev. 1);
iv) information provided by the MIKE-ETIS Technical Advisory Group relating to the ETIS analysis (including Information documents CoP17 Inf. 67 and SC69 Inf. 22);
v) SC70 Com. 15 – p. 2 g) Peer-reviewed scientific publications relating to the ETIS analyses, including: Underwood, F.M., Burn, R.W., Milliken, T. (2013). Dissecting the illegal ivory trade: an analysis of ivory seizures data. PLoS One

8(10): e76539; and Burn, R.W., Underwood, F.M. (2012). A new statistical modelling framework to interpret ivory seizures data: A technical report describing the new modelling framework for analysing seizures data from the Elephant Trade Information System. Mathematics Report series (1/2013), Department of Mathematics and Statistics, University of Reading, UK;
vi) the existing databases and standard operating procedures used in the ETIS analysis; and
vii) other relevant scientific literature and studies on the statistical analysis of:
a. data relating to illegal trade in elephant specimens;
b. illegal wildlife trade data; and
c. other illicit trade data.

The Statistician and the Governance and Business Processes Specialist and Statistician (the consultants) will work with a nominated focal point from the CITES Secretariat (CITES MIKE Coordinator) and oversight will be provided by the MIKE and ETIS Subgroup of the CITES Standing Committee. In addition, the consultants will consult with Parties, TRAFFIC, the statisticians involved in the development of the statistical analysis for ETIS and responsible for the ETIS analysis, the MIKE and ETIS Technical Advisory Group members, and other stakeholders, as appropriate. The CITES MIKE Coordinator will provide assistance to the consultants to facilitate the consultation process. The consultation process should include sharing the progress report, preliminary findings and the final report with Parties, TRAFFIC and the statisticians involved in the development of the statistical analysis for ETIS and responsible for the ETIS analysis.

Ultimate Result of Service:

Governance and Business process Specialist: A detailed report on the review of the governance and business processes of the ETIS programme as well as recommendations to ensure the objectives of the programme as set out in CITES Resolution Conf. 10.10 (Rev. CoP18) can be met over the long term.

Data Management and Statistical Analysis Specialist General: A report on the review of the ETIS programme data management and statistical analysis methodologies, including recommendations to further strengthen the methodology used in the ETIS process and analysis

Title & ID Number of Programme / Project:

Governance and Business Processes specialist; MIKE-ETIS Support: ETIS programme review; SB- 014428

Statistician; MIKE-ETIS Support: ETIS programme review; SB-005458.16.02.03

Is any other department or office of the Secretariat or any other organization of the United Nations involved in similar work to the best of your knowledge? **No**

Travel Details:

Applicable
Travel associated with the consultancy includes (virtual means to conduct consultation to be used, where feasible):

- consultation with relevant TRAFFIC staff (including the former ETIS Director - through electronic means);
- presentation of the preliminary / final report to the CITES Secretariat (Geneva); and
- attend the CITES Standing Committee.

Travel costs will be covered by the CITES Secretariat.

Outputs / Work Assignment:

Deliverables for the Governance and Business process Specialist:
A preliminary and final report prepared by the Governance and Business Process Specialist, in collaboration with the Statistician, that includes specific sections on the following:

a) An executive summary that highlights the main findings and key recommendations (not longer than 12 pages).

b) The key outcomes of the review of the ETIS programme relating to:
i) the technical and operational aspects of the analytical framework of the ETIS programme;
ii) the institutional arrangements for ETIS, including operations and resources;

iii) the provisions contained in Annex 1 of Resolution Conf. 10.10 (Rev. CoP18), with specific reference to sections 2 to 5 and whether these provisions and their implementation are adequate to meet the objectives of ETIS, set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP18);
iv) the overlapping reporting requirements under Res. Conf. 10.10 (Rev. CoP18) and Res. Conf. 11.17 (Rev. CoP18) and challenges posed by the different data-sharing policies; and
v) any other matter identified in the review process that could strengthen the ETIS program.

c) Recommendations, based on the findings of the review of the ETIS programme, including recommendations relating to:
i) the need to amend Annex 1 in Resolution Conf. 10.10 (Rev. CoP18) and if so, propose amendments as required
ii) whether the ETIS analysis is able and suitable to support CITES processes and decision making such as the National Ivory Action Plan process
iii) the means to address overlapping reporting requirements under Res. Conf. 10.10 (Rev. CoP18) and Res. Conf. 11.17 (Rev. CoP18) and challenges associated with the different data-sharing policies
iv) institutional arrangements and resources required to implement any proposed recommendations to amend the current ETIS methodology or Resolution Conf. 10.10 (Rev. CoP18)
v) institutional arrangements and resources required to adequately meet the objectives of ETIS and ensure its longer-term sustainability.

Deliverables for the Data Management and Statistical Analysis Specialist:
A preliminary and final report prepared by the Statistician to be incorporated in the report prepared by the Governance and Business Process Specialist, that includes specific sections on the following:
a) An executive summary that highlights the main findings and key recommendations (not longer than 6 pages).

b) The key outcomes of the review of the ETIS programme relating to:
i) the technical aspects of the analytical framework of the ETIS programme, with specific reference to the aspects referred to in paragraph A i);
ii) the provisions contained in Annex 1 of Resolution Conf. 10.10 (Rev. CoP17), with specific reference to sections 2 to 5; and whether these provisions and their implementation are adequate to meet the objectives of ETIS, set out in paragraph 27 of Resolution Conf. 10.10 (Rev. CoP17); and
iii) any other matter identified in the review process that could strengthen the ETIS program.

c) Recommendations to address any problems identified to and to further strengthen the methodology used in the ETIS process and analysis.
All documents are to be delivered in English and by electronic means.
Expected Duration:

The assignment is expected to last 6 months.
Evaluation Criteria:

Evaluation Criteria for the Governance and Business process Specialist:

Competency:
i) Knowledge and understanding of institutional governance, especially managing sensitive and controversial processes, and balancing the interests of a diversity of stakeholders
ii) Expertise in process analysis and auditing, especially to improve efficiency and transparency, and to verify if procedures, practices and controls are adequate to deliver on stated objectives.
iii) Knowledge of CITES, in particular its decisions, policies and discussions relating to elephant conservation, trade in elephant specimens, elephant poaching and illegal trade in ivory [Resolution Conf. 10.10 (Rev. CoP18)], is desirable.

Skills:
Skills in networking and communications, and experience in structuring meaningful engagement with multiple parties, scientists, specialists and stakeholders.

Academic Qualifications:
University degree (or equivalent) in business administration, governance and policy, wildlife management, conservation or a related subject

Experience:
i) Experience in programme and project evaluation and review, with a strong focus on institutional strengthening, change and restructuring.

ii) Experience in international engagements and decision-making processes, especially those associated with multilateral environmental agreements
iii) Experience in review of governance structures and processes.

Language:
English, French and Spanish are the working languages of CITES. Fluency in English is required. Knowledge of French or Spanish is desirable

Evaluation Criteria for the Data Management and Statistical Analysis Specialist:

Competency:
Knowledge of CITES, in particular decisions, processes and discussions relating to elephant conservation, trade in elephant specimens, elephant poaching and illegal trade in ivory [Resolution Conf. 10.10 (Rev. CoP18)] is desirable.

Skills:
i) Expertise in statistical modelling and interpretation, specifically the use of Bayesian hierarchical models, and in reviewing statistical methodology
ii) Expertise in database management and maintenance

Academic Qualifications:
Advanced university degree (Master's degree or equivalent) in statistics, or a related subject.

Experience:
i) Extensive experience of applying modern statistical methods to produce pragmatic solutions to real world problems
ii) Experience in managing the collection and processing of data and its flow through a system to provide information to policy makers at national and international level
iii) Experience in statistical modelling and interpretation, specifically the use of Bayesian hierarchical models, and in reviewing statistical methodology

Language:
English and French are the working languages of the United Nations Secretariat. English, French and Spanish are the working languages of CITES. Fluency in English is required. Knowledge of French or Spanish is desirable.

Annex D - Documents Consulted

No.	Document Name
Root	
1.	E-CoP17-Inf-67 - China & responses.pdf
2.	E-Notif-2019-046 ETIS & MIKE programming code.pdf
3.	E-Notif-2020-ETIS questionnaire-Annex-Final.docx
4.	E-Res-10-10-R18.pdf
5.	E-Res-14-03-R18 CITES compliance procedures.pdf
6.	E-SC69-Inf-47 - Singapore and Malaysia.pdf
7.	ETIS review - Key issues (CITES meeting_8 July 2020).docx
8.	Methods Paper_Burn_Underwood_Technical_Report…l_ivory_trade.pdf
9.	MIKE ETIS Subgroup ToR .pdf
10.	MIKE ETIS TAG ToR.pdf
11.	Presentation - General Background CITES .pptx
12.	R8_IvoryGuide_07162020_low-res.pdf
13.	understanding-etis-vfinal-web.pdf
14.	Discussion-data access form.docx
15.	DRAFT revised ETIS Data Request Form_Dec 2019 TO.docx
16	1. Methods Paper_Dissecting the Illegal Ivory Trade_An Analysis of Ivory Seizures (2)
17.	2. Methods Paper_Burn_Underwood_Technical_Rep…l_ivory_trade.pdf
18.	3. Methods Adjustments_Comments on Methods in…CITES CoPs.docx
19.	4. CoP18 R scripts_ E-Notif-2019-046 Github links to ETIS code.pdf
20.	5. CoP18 R scripts_Notes on R scripts used in CoP1…ETIS analysis.pdf
21.	6. Criticisms_Annex E_ETIS report analysis_SG challenge.pdf
22.	7. Response to Criticisms_Underwood Proposal Res…est Redacted.pdf
23.	8. Responses to Criticisms_E-SC69-Inf-22 TRAFFIC_TA…ponse to SG.pdf
24.	9. Responses to Criticisms_E-CoP18-Inf-093 ETIS Inf document.pdf
25.	FMU_RWB Response ETIS Internal Review.pdf
26.	SC73 ETIS report final 25 Aug 2020.docx
27.	ETIS review-2019-11-16[1].docx
28.	E-CoP17-Inf-42.pdf
29.	E-CoP17-Inf-67.pdf
30.	E-CoP18-Inf-093.pdf
31.	E-SC69-Inf-22.pdf
32.	E-CoP16-53-02-02.pdf
33.	E-CoP17-57-05-Add.pdf
34.	E-CoP17-57-06-R1.pdf
35.	E-CoP18-069-01-Add (Annual Illegal Trade report & E…IS reporting).pdf
36.	E-CoP18-069-03-R1.pdf
37.	E-CoP16-26 Revision of Res Conf 10.10.pdf
38.	E15-18A07 (need for review of Res Conf.10.10).pdf
39.	Res Conf 10.10 (Rev CoP 14).pdf
40.	Res Conf 10.10 (Rev CoP11).pdf
41.	Res Conf 10.10 (Rev. CoP12).pdf
42.	Res Conf. 10.10 (Rev CoP16).pdf
43.	Res Conf. 10.10 (Rev CoP17).pdf
44.	Res Conf. 10.10.pdf
Articles	
45.	10.1016@j.jeconom.2019.11.pdf
46.	chan2016.pdf
47.	Deviance information criterion for Bayesian model selection_ Just.pdf
48.	An Analysis of Ivory Seizure Data Oct2013journal.pone.0076539.PDF
49.	journal.pone.0076539.pdf
50.	-Elephants in the dust_ the African elephant crisis-2…theDust copy.pdf
51.	World_Wildlife_Crime_Report_2016_final.pdf

52.	E-SC69-29-03-A-05.pdf
53.	SINGAPORE ETIS REPLY.pdf
Notifications	
54.	CITES-NIAP dossier.pdf
55.	Considering the finger Nigeria (ETIS).docx
56.	E-Notif-2019-009.pdf
57.	SINGAPORE ETIS REPLY.pdf
58.	Singapore's observations on ETIS review 25022019.pdf
59.	对方法的意见-EN (China).docx
60.	E-Notif-2020-005-A1.docx
61.	E-Notif-2020-005-A2.pdf
Forms	
62.	3 English ETIS data collection electronic form.pdf
63.	4 English ETIS explanatory notes.pdf
64.	ETIS-standard-spreadsheet.xls
65.	Illegal trade report Guidance E-Notif-2019-072-A2.pdf
66.	Re_ [MIKE-ETIS TAG] Review of supporting informat…lysis R code.eml
67.	CITES_secretariat_organigrammes_v1_04122018.pdf
68.	CITES-Convention-EN.pdf
Others	
69.	SoPs outline Final draft Feb_2020-updates_FU_TM-LS_REV_12_03_2020.docx
70.	SoPs FMU revisions 20200217.docx
71.	TAG16 Draft Minutes July 2020 - All sessions_SBM.docx
72.	ETIS Online User Guide_v1_09_2020.docx
73.	ETIS website modifications example after external review call.pptx
74.	Underwood Foresnsics.pdf
75.	Functional Specification Final version.doc
76.	Daniel Stiles, Rowan Martin and Brendan Moyle (2015). Analysis of Ivory Demand Drivers - Draft
77.	UNODC, World Wildlife Crime Report 2020: Trafficking in Protected Species
78.	TRAFFIC: The Global Ivory Trade - https://www.traffic.org/what-we-do/perspectives/the-ivory-trade/
79.	Yufang, Gao & Clark, Susan. (2014). Elephant ivory trade in China: Trends and drivers. Biological Conservation. 180. 23–30. 10.1016/j.biocon.2014.09.020.

Annex E - Interview Sessions that informed the ETIS Review

No.	Date	Stakeholder	Participant(s)
Inception phase			
1.	25 June 2020	CITES Secretariat	• Ms. Thea Carroll - CITES MIKE Coordinator
2.	3 July 2020	TRAFFIC	• Mr. Steven Broad - Executive Director • Ms. Thomasina Oldfield - Director of Programmes and Research • Ms. Louisa Sangalakula - Programme Officer • Ms. Sharon Baruch-Mordo - Senior Analyst, Elephant and Rhino Trade
3.	8 July 2020	CITES Secretariat	• Ms. Ivonne Higuero - Secretary General • Mr. Juan-Carlos Vasquez - Chief Legal Affairs and Compliance • Mr. Barend Janse van Rensburg - Chief Enforcement Support • Mr. Tom De Meulenaer - Chief, Scientific Services • Mr. Johannes Stahl - Enforcement Scientific Services Support Officer • Ms. Pia Johnsson - Enforcement Support Officer
4.	9 July 2020	TAG Member	• Dr. Holly Dublin
5.	10 July 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst, Elephant and Rhino Trade
6.	22 July 2020	TAG Members	• Dr. Carl Schwarz • Dr. Andy Royle
7.	12 August 2020	TRAFFIC (former)	• Mr. Tom Milliken, Elephant and Rhino Programme Leader
Fact-finding phase			
CITES Secretariat			
8.	11 September 2020	CITES Secretariat	• Ms. Thea Carroll - CITES MIKE Coordinator
9.	01 October 2020	CITES Secretariat	• Ms. Thea Carroll - CITES MIKE Coordinator
10.	01 October 2020	CITES Secretariat	• Mr. Johannes Stahl - Enforcement Scientific Services Support Officer
11.	9 October 2020	CITES Secretariat	• Mr. Tom De Meulenaer - Chief, Scientific Services
12.	14 October 2020	CITES Secretariat	• Mr. Barend Janse van Rensburg - Chief Enforcement Support • Ms. Pia Johnsson - Enforcement Support Officer
13.	20 October 2020	CITES Secretariat	• Ms. Thea Carroll - CITES MIKE Coordinator
14.	29 October 2020	CITES Secretariat	• Ms. Ivonne Higuero - Secretary General
CITES National Management Authorities			
15.	18 September 2020	CITES Management Authority: Federal Republic of Nigeria - Department of Forestry	• Mr. Timothy Daniel John • Mr. Rasak Kolawole Adekola • Ms. Tessy Imogie
16.	21 September 2020	CITES Management Authority: Republic of Singapore - National Parks Board	• Ms. Janice Yap Ms. Renhui Xie • Ms. Anna Wong

			• Mr. Gerald Neo
17.	21 September 2020	CITES Management Authority: Republic of Uganda - Department of Wildlife Conservation, Ministry of Tourism, Wildlife and Antiquities	• Mr. Barirega Akankwasah • Mr. Charles Thumwesigye
18.	22 September 2020	CITES Management Authority: People's Republic of China - Department of Wildlife Conservation / The Endangered Species Import and Export Management Office of the People's Republic of China	• Mr. Su Rui • Mr Wu Zhongze • Dr. Ping Xiaoge
19.	22 September 2020	CITES Management Authority: United Republic of Tanzania - Wildlife Division, Ministry of Natural Resources and Tourism	• Mr. Eligi P. Kimario
20.	23 September 2020	CITES Management Authority: Republic of Kenya - Kenya Wildlife Service	• Mr. Patrick Omondi • Mr. Solomon Kyalo • Mr. Sospeter Kiambi
21.	24 September 2020	CITES Management Authority: Republic of South Africa - Department of Environmental Affairs, Biodiversity Compliance Monitoring and Enforcement	• Ms. Sonja Meintjes
22.	28 September 2020	CITES Management Authority: Federation of Malaysia - Ministry of Energy and Natural Resources, Biodiversity and Forestry Management	• Mr. Kamarul Ikram bin Abdul Halim • Mr. Pazil Bin Abdul Patah • Ms. Norsham binti Abdul Latip • Ms. Farrah Shameen binti Mohamad Ashray • Mr. Abdul Rahman bin Abdul Aziz
23.	28 September 2020	CITES Management Authority: Socialist Republic of Vietnam - Viet Nam CITES Management Authority, Ministry of Agriculture and Rural Development	• Mr Vuong Tien Manh • Mr. Anh Tuan Nguyen
24.	28 September 2020	CITES Management Authority: Republic of Mozambique - Ministry of Land and Environment, National Administration of the Conservation Areas	• Mr. Nunes Tomas Mazivile
25.	29 September 2020	CITES Management Authority: -Kingdom of Thailand - Department of National Parks, Wildlife and Plant Conservation, CITES Office	• Ms. Klairoong Poonpon
26.	30 September 2020	CITES Management Authority: Togolese Republic - Direction des Ressources Forestières, Ministère de l'Environnement, du Développement Durable et de la Protection de la Nature	• Dr. Amah Atutonu • Lt/Col Adjei-Toure Issobou • Cdt. Aboudou Mensa
27.	5 October 2020	CITES Management Authority: Republic of Zimbabwe - Parks and Wildlife Management Authority	• Ms. Patience Gandiwa • Ms. Roseline Mandisodza-Chikerema
28.	6 October 2020	CITES Management Authority: Kingdom of Belgium - Directorate General Environment, Service Multilateral and Strategic Affairs CITES Unit	• Ms. Miet Van Looy
29.	7 October 2020	CITES Management Authority: Gabonese Republic - Ministère de la Forêt, de l'Environnement et de la Protection des Ressources Naturelles	• Mr. Serge Mibambani
TRAFFIC			
30.	25 August 2020	TRAFFIC	**Review of ETIS Online Database:**

			• Ms. Louisa Sangalakula - Programme Officer • Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
31.	28 August 2020	TRAFFIC	**Review of ETIS Online Database Admin Dashboard:** • Ms. Louisa Sangalakula - Programme Officer • Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
32.	4 September 2020	TRAFFIC	**Primer on ETIS Data Structure, SQL File and R-Code**: • Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
33.	02 October 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
34.	20 October 2020	TRAFFIC	• Mr. Steven Broad - Executive Director • Ms. Thomasina Oldfield - Director of Programmes and Research
35.	20 October 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
36.	23 October 2020	TRAFFIC (former)	• Mr. Tom Milliken, Elephant and Rhino Programme Leader
37.	23 October 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
38.	02 November 2020	TRAFFIC	• Ms. Louisa Sangalakula - Programme Officer
39.	24 November 2020	TRAFFIC	• Ms. Sharon Baruch-Mordo - Senior Analyst Elephant and Rhino Trade
MIKE-ETIS Subgroup / TAG			
40.	24 September 2020	Chair MIKE-ETIS Subgroup (former)	• Mr. Basile van Havre
41.	05 November 2020	TAG Member	• Dr. Holly Dublin

Annex F - Interview Protocol for Consultations with Parties

This protocol is a generic one and was somewhat adapted, along with the supporting questions, for each CITES Management Authority met during semi-structured interviews.

Message sent to Parties

As you are aware, the CITES Secretariat was requested by the 70th meeting of the Standing Committee to: "*i) subject to external funding, appoint a group of independent experts to carry out the review of the ETIS programme under the oversight of the MIKE and ETIS Subgroup and a nominated member of the MIKE and ETIS Technical Advisory Group*" (*SC70 SR*)."

At CoP18, CITES Parties also adopted Decisions 18.18 – 18.20 on the Review of the ETIS programme:

Decision 18.18
Decision directed to: Secretariat

The Secretariat shall include in the terms of reference for the review of the Elephant Trade Information System (ETIS) programme, the issue of overlapping reporting requirements created under Resolution Conf. 10.10 (Rev. CoP18) on Trade in elephant specimens and Resolution Conf. 11.17 (Rev. CoP18) on National reports and the challenges posed by the different data-sharing policies, and work closely with the consultants carrying out the review to identify possible solutions.

Decision 18.19
Decision directed to: Secretariat

The Secretariat shall report the findings of the review of the ETIS programme requested by the Standing Committee, and any recommendations emanating from the review, at the 73rd meeting of the Standing Committee.

Decision 18.20
Decision directed to: Standing Committee

The Standing Committee shall review the findings and recommendations reported by the Secretariat in accordance with Decision 18.19 and make recommendations for consideration at the 19th meeting of the Conference the Parties.

The CITES Secretariat appointed the following two consultants to carry out the review:
Ms. Daniela di Filippo will be responsible for the data management and statistical analysis part of the review;
Mr Camillo Ponziani will be responsible for the governance and business process review.

As part of the review the consultants will engage some CITES Parties. Your country has been highlighted in the ETIS analysis to CoP18 as a Category "X" country, is an African elephant range State and has participated in discussions relating to the ETIS review. It will be appreciated if you could indicate whether you are interested in and available for an online discussion with the consultants? If so, please let me know whether **Day of Week, Day Month Year at Time** will be acceptable for the online discussion?

Context and Guidance Provided to Parties at Interview

- The interview is confidential;

- While you will be named as a key informant of the ETIS review in our list of consulted stakeholders, your specific contribution and any concerns raised will be anonymous. We will not associate your name with anything specifically included in the ETIS review report;
- You will have received the questions in advance which have been designed to cover the range of issues addressed by the review. Notwithstanding, you are welcome to bring up any issues or concerns over and above the questions;
- We will try to keep the interview capped at one hour in length, but you are free to contact the consultants thereafter should anything else come to mind;
- The review team may contact you to verify anything that came out of this session or cross reference anything that may come out of subsequent interviews which may be relevant to your contribution;
- The questions will be used to guide the discussion through a more conversational exchange – ideally keeping fairly closely to the order of questioning.

Interview Questions

1. What do you think about the significance of ETIS and the manner in which the ETIS analysis is used to inform decision making by CITES Parties relating to, among others, the National Ivory Action Plan? Do you think the process is robust and transparent?
2. Do you believe the on-line access to all your validated and / or pending data will facilitate timely reporting and the use of ETIS data to inform enforcement in your country?
3. How should communication relating to the ETIS data, as well as the analysis with CITES Parties, be improved?
4. Are ETIS' supporting processes, deadlines for reporting data and governance generally well-documented and clear? How would you recommend improving things if there is a gap?
5. Are there any redundancies and duplication of efforts with other CITES activities and requirements? If so, how would you suggest optimizing this?
6. Do you believe the on-line access to the statistical code used to inform the ETIS report to CITES meetings of Conference of Parties and Standing Committees would establish a good foundation towards transparency and constructive feedback for further improvements?
7. Do you think the ETIS methodology is clear? Does it allow you to understand the analysis produced and their implications? If not, why is it not clear to you?
    A. Only statisticians can really understand the ETIS methodology.
    B. You understand statistical methods but still the ETIS methodology is not clear.
    C. Other.
8. In terms of data collection, what do you think would be a key factor that ETIS should implement in order to raise the response rate (improve the rate of submission) of ETIS data (seizure data)?
9. The timeframe for submission of ETIS data (within 90 days of seizures occurrence) seems to create some challenges. This also differs from the deadline for the submission of the annual illegal trade reports that should be submitted by October each year (for the preceding year). What would be your suggestion in order to eliminate double/parallel reporting?
10. Do you think the ETIS analysis are based only on factual information and data submitted by Parties? There are qualitative elements, such as market information and other reports that are referenced especially in the sections where the Categories are discussed (assessment of the cluster analysis) – are the sources clear and are you able to distinguish between qualitative information and expert opinion? Are the criteria or reasons why a country is placed in a specific NIAP category (category A, B, C) clear to you?
11. In terms of Resolution 10.10 (Rev. CoP18) TRAFFIC is responsible to manage and coordinate ETIS. In your opinion, are there any other possible options / models?
12. Do you have any concerns in relation to the fact that data governance, analytics and reporting are managed by TRAFFIC? If so, what are your concerns and what would be your recommendation to address these?

Annex G - Examples of Delays Encountered by the Consultants in the Receipt of Key Information to Support the ETIS Review

No.	Request	Requested from TRAFFIC	Received
Governance and Business Process Specialist			
1.	Review of high-level ETIS system diagram	9 September 2020	30 November 2020
2.	Validation of 3 flows: • enter single seizure record • upload seizure records MS Excel file • View and Action Pending Seizure Record	22 September 2020	6 November 2020
3.	Articulation of plan for ETIS upgrades in 2020 and 2021 and description of process by which these will be prioritized	7 August 2020	21 December 2020
4.	Database relationship diagram / database schema	16 July and 18 August 2020	Not received
Data Management and Statistical Analysis Specialist			
5.	Validation of the R code developed to run Camillo Ponziani's queries	22 October 2020	Not received – issues resolved via meeting with Louisa on 2nd November 2020
6.	Validation of the order of the R scripts for the trend analysis	19 October 2020	19 January 2021
7.	19 pre-programmed checks executed in R to validate ETIS data	September 2020	Not received – issue resolved by accessing the Excel file that is produced when the checks are executed
8.	Complete list of all seizures with their respective Source Score Reliability (A, B and C)	September 2020	Not received – issue resolved by accessing the ETIS online portal where the Source Score is assigned for all seizures although non assignations (blanks) still remain in R. There is probably a problem with the execution of Run Ruby.
9.	The seizure database (2018) with which the code published on GitHub was supposed to be run.	September 2020	In October 2020, TRAFFIC provided the 2020 dataset. The correct database (2018) was provided in December 2020.

The production of the ETIS review has been quite challenging, for the following reasons:

- Due to health reasons, it has not been possible to arrange e-meetings or e-conversation with Fiona M. Underwood and Robert W. Burn who were the main statisticians responsible for the formulation of the ETIS methodology. Fiona Underwood only partially responded to a number of statistical questions asked in writing[79]that were posed to her attention.

[79] The questions asked to Fiona M. Underwood can be accessed through this link https://www.dropbox.com/s/4btqie7bu938uu3/Questions%20for%20Fiona.docx?dl=0

- TRAFFIC's new Senior Analyst, who is responsible for the ETIS analysis and methodology, was only appointed in 2020 and is in the process of becoming familiar with the methodology. For example, the Senior Analyst reported that there was no time to analyze the cluster analysis part of the methodology and hence could not be consulted on this. Additionally, the Senior Analyst did not receive a detailed, in-person handover from the previous staff and consultants that had been responsible for the ETIS analysis and methodology.

- Due to health issues and pre-scheduled tasks, it was difficult to receive all the required documentation from TRAFFIC in time. For example, the launch of the ETIS online facility and other personal circumstances made it difficult to consult the TRAFFIC Senior Analyst.

- The ETIS methodology was developed around 2013. Since then, many changes have been made and these have been documented in a number of documents. It was quite challenging to put together the latest version of the ETIS methodology from beginning, i.e., the data collection phase, till the end, i.e., the categorization of countries into the NIAP process.

  To address this, TRAFFIC was asked to provide a list of documents that needed to be consulted to have a clear understanding of the current ETIS methodology.

  Unfortunately, the list provided by TRAFFIC was incomplete. The following are some examples of the information that were essential to inform the ETIS review but were not provided:

  ◊ In the list of the documents provided by TRAFFIC, there was no explanation on how the NIAP categories A, B, and C are determined on the basis of the cluster analysis. This explanation was found in different CoPs reports (CoP 16, 17 and 18) but there was no mention of it in the documents that were meant to explain the ETIS methodology produced by TRAFFIC.

  ◊ The database initially provided by TRAFFIC for the purpose of this review was not the same database that was used to produce the report considered by Parties at CoP18. For this reason, it was quite difficult to replicate the results contained in CoP18 report.
  The correct database was provided only in December 2020.

  ◊ The code made available to Parties on GitHub through Notification No. 2019/046 of 17 August 2019 does not have some of the R scripts and csv files[80] that were useful for the purpose of this review. These R scripts and csv files were requested to TRAFFIC but were not provided.

  ◊ Validation of the sequence prepared by the statistical consultant that provides a numbering on how the R scripts should be run one after another was requested but only partially provided in January 2021. TRAFFIC validation includes the trend analysis only, hence validation on the Cluster Analysis was not provided.

  ◊ The Standard Operating Procedures (SOPs) manual that was provided by TRAFFIC for the purpose of this review is not updated. Some information contained in the SOPs manual give contradicting instructions. TRAFFIC has recognized that one of their first priorities is to conduct a full review and update the SOPs manual.

The answers received from Fiona M. Underwood can be accessed through this link
https://www.dropbox.com/s/i3qg8b2h8gh752n/FMU%20Response%20to%20ETIS%20review%20questions.docx?dl=0

[80] A broad explanation on this point with the list of missing documents is provided in Chapter 4 "Data analysis. (R-code and algorithm used for analysis)".

Annex H - PowerPoint Presentation of Preliminary Findings and Observations

Preliminary Findings - CITES Secretary Gene

Annex I - Short and Long-Term ETIS/TRAFFIC Development Plan

ETIS near-term tasks:

1. Fix ETIS Online release bugs by S-Branch.
2. Work with S-Branch to manage new issues with user registration of ETIS Online (e.g., block bots), and to implement new scheduling email system with notifications to CITES Management Authorities, the user/applicant, and CITES Secretariat to maintain timely management of registration process.
3. Finalize with Secretariat CITES-ETIS website.
4. Revise SoP to reflect new ETIS Online data collection and any other updates.
5. Work with the CITES Secretariat to release of CITES notification for ETIS data collection form in early 2021.
6. Concurrently to notification, outreach to Parties to introduce ETIS Online and seek missing data for past years; offer support and training for ETIS online.
7. Address any outstanding and ongoing data queries from CITES Parties or external Parties.
8. Outreach internally to TRAFFIC offices to gather ivory market survey data.
9. Outreach to key Parties (e.g., the Netherlands, USFWS) to raise funds for future operations of ETIS.

Longer-term tasks (and especially as past 2018-2020 data arrives)

1. Re-run trends analyses to at least include more complete 2018-2019 data and consult with TAG statisticians to:
    a. Assess model fit to large weight classes;
    b. Address true zeros versus non-reporting;
    c. Implement any suggested changes by ETIS external review team.
2. Cluster analysis code review and implementation by new analyst.
3. Pursue modeling exploration of the impact of removing lower source grades (B and C) data from trends analyses.
4. Revisit covariates used in analysis especially following the release of ETIS Online (reporting rate covariates), and possibly pursue mechanistic covariate modeling.
5. Throughout the modeling review and implementation process, engage in discussions with Tom Milliken and Fiona Underwood to fill in any remaining gaps (given both were unavailable when new analyst started).
6. Produce any required reports/proposals to funders and to the CITES Secretariat.

Annex J – Consolidated List of Acronyms & Abbreviations

BIDS	Bad Ivory Database System
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
(CITES) Parties	Countries that are 'members' of CITES
CMA	CITES Management Authority
CoP	CITES Conference of the Parties
CPI	Corruption Perception Index
DO	Data Operator
DP	Data Provider
ETIS	Elephant Trade Information System
ICCWC	International Consortium on Combating Wildlife Crime
Interpol	International Criminal Police Organization
IUCN	International Union for Conservation of Nature
LE Ratio	Law Enforcement Effort Ratio
M&E	Monitoring and Evaluation
MIKE	Monitoring the Illegal Killing of Elephants
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
NIAP	National Ivory Action Plan
OECD	Organisation for Economic Co-operation and Development
SA	System Administrator
SC	Standing Committee
SDG	Sustainable Development Goal
SoP	Standard operating procedures
TAG	Technical Advisory Group
ToR	Terms of Reference
TRAFFIC	Trade Records Analysis of Flora and Fauna in Commerce (NGO)
UN	United Nations
UNEP	United Nations Environment Programme
UNODC	United Nations Office on Drugs and Crime
WCA	World Customs Authority
WCO	World Customs Organization

Annex K – Rating of the ETIS review

As explained in the Preamble section, more than 70 documents, publications, presentations and reports were provided to the evaluation team and these constituted the basis for the ETIS statistical review assessment.

In particular, the following statistical international standards, are the documents that have influenced the most the formulation of the assessments and ratings provided in this statistical review.

- The UN Principle Governing the International Statistical activities https://unstats.un.org/unsd/methods/statorg/Principles_stat_activities/principles_stat_activities.asp
- The UN fundamental principles of National Official Statistics https://unstats.un.org/unsd/dnss/gp/fundprinciples.aspx
- How the latest UN statistics on SDGs data were conducted https://unstats.un.org/sdgs/report/2020/

Ratings for the ETIS review were assessed according to the following rubric:

Highly Satisfactory: The evaluated process has no shortcomings in terms of whether the processes used by TRAFFIC sufficiently contribute to achieve the objectives of ETIS as specified in the Resolution and whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan (NIAP) process.

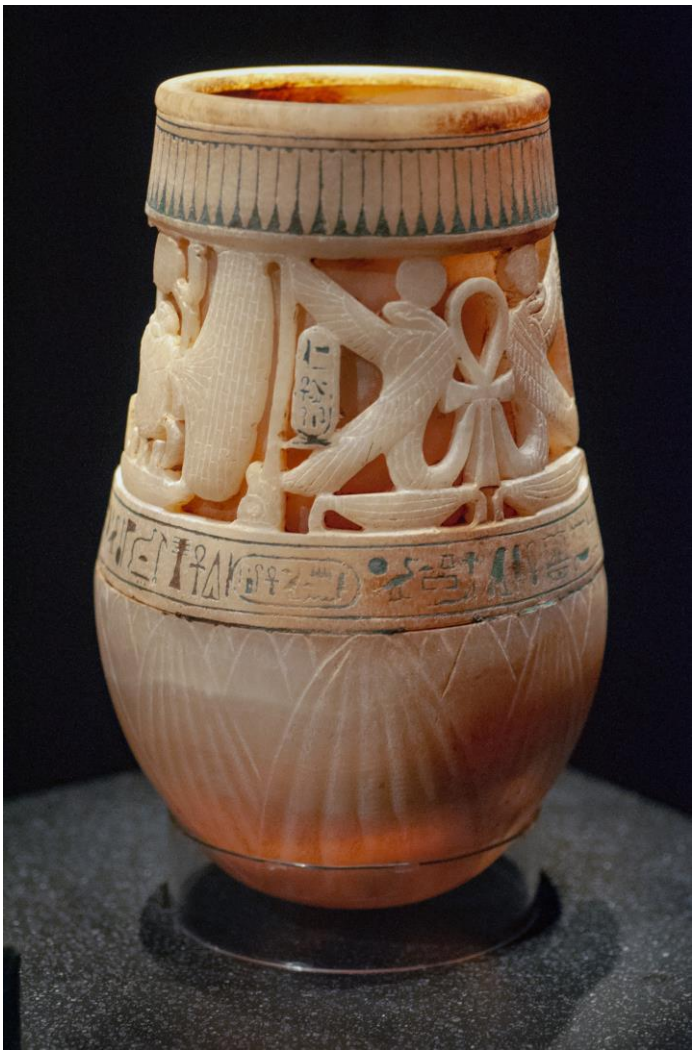
Satisfactory: The evaluated process has minor shortcomings in terms of whether the processes used by TRAFFIC sufficiently contribute to achieve the objectives of ETIS as specified in the Resolution and whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan (NIAP) process.

Moderately Satisfactory: The evaluated process has moderate shortcomings in terms of whether the processes used by TRAFFIC sufficiently contribute to achieve the objectives of ETIS as specified in the Resolution and whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan (NIAP) process.

Moderately Unsatisfactory: The evaluated process has significant shortcomings in terms of whether the processes used by TRAFFIC sufficiently contribute to achieve the objectives of ETIS as specified in the Resolution and whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan (NIAP) process.

Unsatisfactory: The evaluated process has major shortcomings in terms of whether the processes used by TRAFFIC sufficiently contribute to achieve the objectives of ETIS as specified in the Resolution and whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan (NIAP) process.

Highly Unsatisfactory: The evaluated process has severe shortcomings in terms of whether the processes used by TRAFFIC sufficiently contribute to achieve the objectives of ETIS as specified in the Resolution and whether the ETIS analysis is able to support CITES processes and decision making such as the National Ivory Action Plan (NIAP) process.



STATISTICAL REVIEW OF THE ELEPHANT TRADE INFORMATION SYSTEM (ETIS)

Data Management and Statistical Analysis

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