ኮሚሽን መፅናዕቲ ጀኖሳይድ ትግራይ

Commission of Inquiry on Tigray Genocide

Executive Summary

Reversed Decades: War and Siege Damage and Loss of Tigray's Natural Resources and Environment

Volume 1

November, 2025

Executive Summary

Introduction:

Tigray region, Ethiopia, has been a beacon of environmental restoration before the war disturbs its progress. The region was combating desertification and restoring degraded lands through community driven initiatives such as natural resources regeneration, reforestation, and soil and water conservation. These efforts not only curbed desertification but also revived ecological balance, restored flora and fauna, improved soil fertility, water availability, agricultural productivity, and inspired global recognition for sustainable land management.

However, the war in Tigray which erupted in November 2020, and was followed by a total siege and blockage, inflicted severe damage on the region's environment and natural resources. The war has profoundly degraded the region's natural capital, posing serious threats to vital ecosystems, agricultural livelihoods, and biodiversity. In response, this study was conducted to quantify the extent of damage and losses to Tigray's natural resources and environment. This includs soil and water resources, soil and water conservation structures, forest resources, general gnvironmental conditions, livestock breeds, fish and honeybee species, as well as wildlife and ecotourism potential. The findings aim to provide a foundation for the urgent recovery, rehabilitation and sustainable reconstruction of Tigray's environment and natural resources.

Methodology:

Both qualitative and quantitative data were collected using a combination of structured questionnaires, focus group discussions, field Observations, and desk reviews. In addition, soil samples were collected from selected hotspot areas for laboratory analysis to verify soil contamination levels and assess soil damage. forest damage was assessed using circular plot-based forest damage survey with sample plots (25m radius, ~0.196 ha). All instruments were administered by trained data collectors and coordinators with expertise in natural resources and environmental assessment, along with community engagement. Quantitative data were analyzed using SPSS version 23, Python and STATA software, while Excel was used to summarize the data in figures and tables. Narrative and content analysis were performed for qualitative data. Results were summarized and presented using tables, graphs, and geospatial visuals. This report

documents damages and losses occurring between November 2020 to November 2022. The assessment was limited to accessible zones of Tigray, excluding Western Tigray and certain woredas in Northwestern and Eastern zones.

Results:

Tigray's natural resources and environmental systems have endured widespread and delibrate devastation as a result of the war, a situation exacerbated by a prolonged siege and blockade. This destruction has manifested in various forms and degrees of severity, degrading ecosystems, biodiversity, and the region's overall ecological balance. While efforts have been made to quantify the damage, the full extent of the natural resources and environmental destruction cannot be fully captured in monetary terms. The legacy of this damage continues to shape the biophysical and socioeconomic situation of the area with cascading effects that may produce unforeseen consequences. These evolving impacts will also pose significant challenges for rehabilitation as costs are unpredictable and difficult to estimate based on the limited data collected immediately after the war. Recognizing this complexity, this study quantifies the extant damage to provide an indicative estimate of the destruction. It aims to serve as a foundational guide to the long term recovery and reconstruction efforts required to restore Tigray’s environment and natural resources.

The Damage and Loss Assessment (DaLA) of soil and water resources, as well as soil and water conservation structures (SWC), revealed that most of the damages were multidimensional. The total area of damaged soils was estimated at 20,859.48 ha, which has led to a dramatic change in soil characteristics and their productivity. Furthermore, the assessment documented a widespread destruction of physical soil and water conservation, the removal of the biological SWC measures, occurrence of sheet erosion, and the development and advancement of gullies. Accordingly, the field assessments revealed that an area of 145,438.6 ha was damaged due to the destruction of SWC structures. These resulted in a total estimated damage and loss values of about 4,229.88 million US$ on soil resources, and the soil and water conservation structures. Moreover, water sources damage, including complete drying of water sources, reduction in discharge, and water pollution, were also observed. The majority of all the above-mentioned damages were committed by Eritrean Defense Forces (EDF) and Ethiopian National Defense Forces (ENDF). However, it is important to note that multiple actors were mentioned in most of the cases for the damages committed in different areas.

In addition, out of 179,039 ha, the total sampled forest areas, 95,248 ha (53.2%) was affected during the Tigray's war and total siege. The estimated forest damage was found to be 601,361.57 ha. The damages across all forest resources amounts to an extensive ecosystem service loss of approximately 37,535.70 million US$ within the five years of the time frame since the start of the war. The war and siege led to widespread deforestation in the region due to military operations, artillery strikes, looting, increased firewood consumption and charcoal production, disruption of forest management activities, and lack of proper management and protection of forest resources. A field survey showed that keystone tree species were damaged due to the war and siege that have significant implications for the environment and livelihood disruption of the local communities. Deliberate acts of destruction and causal factors were observed as forest damage causes. The ENDF and EDF were reported to be the most responsible parties for the forest resources damage, respectively.

Moreover, the tragic damage of the war and siege extended on wildlife resources, resulting in local extinctions of medium and large mammals as well as disruption of the conservation concern birds. The war damage on medium and large mammal species local extinctions was estimated at about 3,260.69 million US$, while the estimated economic impact of local extinctions among conservation concern bird species was approximately 1,175.54 million US$. Sound disturbance, habitat destruction and institutional collapse, wildlife poaching, subsistence hunting, and toxification and pollution were the most frequently observed pathways that caused damage to wildlife. War damage on Tigray's ecotourism potential attractions (fauna, flora, and landscape beauty) as well as the infrastructural and services sectors was also noted by 73% of the respondents. The majority of the damage were executed by EDF, followed by ENDF, and Amhara Forces. Furthermore, human wildlife conflict escalated due to habitat destruction, war induced behavioral change of carnivore species and local extinction of wild prey. Additional impact of the war on wildlife and their habitats in Tigray were driven by internal displaced persons who settled around several localities. Their presence disturbed local ecosystems through multiple chanalles including including fuel wood collection, sound disturbances, and environmental pollution.

Significant damage and losses have been also recorded as a result of environmental polution and poor waste management following the Tigray war and siege. About 364.66 million US$ has been estimated as damage and loss values in this sub-sector. Urban

forests, green parks, and street medians were deteriorated due to financial cuts and a lack of management. Deliberate mixing of chemicals with soils, pouring of chemicals into the rivers and water bodies, waste mismanagement, and burning of industries were the causes that contributed to environmental pollution. In addition, materials essential for solid and liquid waste management were looted; waste management systems collapsed, resulting in widespread accumulation of wastes in urban open areas, streets, rivers, and adjacent agricultural lands. Furthermore, institutional capacity, which works on environmental issues, environmental quality monitoring systems, and infrastructure, was significantly dis-functioned. EDF and ENDF were identified as the primary actors of the damages.

Finally, the war in Tigray has had a devastating impact on the region's biodiversity, causing significant damage to livestock breeds, honeybee and fish species, crop varieties and breeding resources. According to the assessment, the livestock breeds most severely impacted due to the war and its aftermath include cross-breed cattle, Common Highland Sheep, Common Highland Goat, and Double and single comb chicken. Breeding programs and research activities, particularly at the Abergelle Agricultural Research Center, were interrupted, halting the genetic improvement program for Abergelle and Begait goats. In addition, honeybee colonies disappeared, bee hives were destroyed, and experts and technicians were killed and displaced. Moreover, fish species were fully and or partially disappeared from water sources due to water poison and fish over-harvesting. Furthermore, crop varieties developed to fit with Tigray agro-ecological zones were damaged and their seeds were not maintained. Gundagundo, the distinct orange variety in the region, and the hermaphrodite Maradol papaya variety, which is the best variety recently introduced to different lowland areas of Tigray were also heavily damaged. The ENDF, EDF, and Amhara forces were identified as the main perpetrators of the damages and losses that occurred in this sub-sector. The estimated damage value of honeybee species were about 1.11 million US$, 8.24 million US$ for honeybee breeding inputs, and 0.58 million US$ for goat breed and its breeding inputs. The estimated loss value of breeding goats were also about 0.71 US$.

Impact:

The Tigray war and siege will have long-term impacts on the environment, natural resources, biodiversity, and communities that depend on them. Damage on soil and water resources will alter chemical properties of soils, negative impact on human health, results in human and animal death, drying up plant varieties, and reduce the productive capacity of the land that leads to sever poverty and environmental degradation. In addition, the war induced deforestation disrupts water cycles, local economy, and traditional livelihoods, and increases droughts and floods, which leads to poverty and vulnerability. Moreover, the damage on wildlife species and their habitat disrupts food webs, fragments and destroys their habitat, biodiversity declines significantly diminishes ecotourism attractiveness and potential income from the sector as well as escalated the human wildlife conflict. Furthermore, the damage and loss of genetic wealth of livestock breeds, fish and honeybee species, and diverse crop varieties will cause reduction in production, productivity, and loss of diversity. In monetary terms, about 46,577.11 million US$ has been been estimated as damage and loss values of the region's environment and natural resources.

Conclusion:

The assessment conducted on the environment and natural resources showed multifaceted damage. Significant damage and losses have registered in soil and water resources, forest and its ecosystem, livestock breeds, fish and honeybee species, crop varieties, wildlife and ecotourism potential, and the environment. Although it is difficult to valuate all the damages and losses occurred on Tigray's natural resources and environment into monetary value, this study provides an indicative estimation. Accordingly, the total estimated damage and loss of the environment and natural resources of Tigray is about 46,577.11 million US$ (**Table 1**). This all damages and loss will have short and long-term impacts on the environment, natural resources, biodiversity, and communities that depend upon them. It is also important to note that the war was purposely designed to destroy the natural resources of the region. It is found that EDF, ENDF and Amhara Forces were the main actors of the damages on natural resources and environment. Provided that multiple actors were mentioned in most of the cases for the damages committed in different areas.

Recommendations: the following issues need urgent attention, immediate action and follow-up for recovery and reconstruction efforts of Tigrays's natural resources and environment.

- The soil identified as polluted should be treated, and further identification of polluted areas is needed
- Action to stop ongoing deforestation, and further efforts to rebuild the forest sector through reforestation, rehabilitation of degraded areas, and implementing sustainable forest management practices is another intervention area.
- The most critical hazardous sites due to chemical dumping, and areas with concentrated unexploded ordnance should be mapped and cleaned up.
- Further quantitative assessment on livestock breeds, Honeybee and fish species, and crop varieties is required to fully estimate the damage and loss values.
- Restocking of damaged animal breeds and crop varieties is essential
- Restoration of wildlife habitats and conservation institutions as well as ecotourism initiatives is another issue to be addressed
- Finally, damage-based claim for compensation, recovery, rehabilitation, and reconstruction has paramount importance.

Table 1. Summary of Damage and Loss Assessment Values

Sub sectors	**Effect (US$ in Millions)**		
	Damage	**Loss**	**Total**
Soil and Water Conservation	122.31	4,107.56	4,229.88
Forest Resources	200.2	37335.5	37,535.70
Wildlife	4,436.23	--	4,436.23
Environmental Pollution and Waste Miss Management	31.32	333.34	364.66
Goat Breeds and Honeybee Species	9.93	0.71	10.64
Total	4,799.99	41,777.11	46,577.11

Source: CITG, 2022 and 2023

Note to the Reader

This document constitutes **Volume I of the Natural Resources and Environment War and Siege Damage and Loss Assessment Report**. It presents verified, self-reported data from Community Representative Interviews, Focus Group Discussion, laboratory analysis, Field Survey and Field observation across the Tigray region. Due to constraints in temporal and geographic coverage, **subsequent volumes will follow** to incorporate additional findings.

Key considerations for interpreting this volume:

- The monetary values reported represent **intergenerational assets and accumulated wealth**, not annual budgets or gross domestic product figures. They should not be compared with fiscal or economic aggregates.
- The report covers regional soil resources, soil and water conservation structures, forest resources, wildlife and ecotourism, environmental pollution and waste mismanagement, Livestock Breeds, and Fish and Honeybee species within the scope of the assessment in Tigray, capturing the breadth of war-related effects across the natural resources and environmental sector.
- **Losses far exceed visible damage**. The prolonged siege and blockade—lasting more than two years—led to widespread natural resources and ecosystem services deterioration and degradation, and lasting setbacks in soil and water resources, biodiversity, forest, and wildlife and ecotourism, which persisted long after the damage occurred, and will have an impact to climate change.
- These cumulative losses, though harder to quantify, are **central to understanding the full impact of the crisis** and must inform any recovery or justice framework.

Readers are encouraged to approach this volume as a foundational reference, recognizing both its rigor and its limitations. The data herein reflects lived realities and institutional memory, and its interpretation demands sensitivity to context, scale, and the enduring consequences of the war.

For the details you can read the whole Report Document at:
https://citghub.org/reversed-decades-war-and-siege-damage-and-loss-of-tigrays-natural-resources-and-environment-volume-1/