Creation Care in Maasailand
Utunzaji wa Uumbaji katika Muktadha wa Wamaasai
Erripoto oo Nkitobirunot te Enkop oo Irmaasai

Lessons to Bless the Church and God's Good Creation

Secondary Education

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Title: Creation Care in Maasailand
Identifiers: ISBN: 979-8-234-05793-8
Subjects: Climate change. | Global warming. | Maasai. | Biblical creation care. | Ecotheology. | Ecological justice. | Indigenous environmental knowledge. | Climate science. | Faith-based climate activism. | Evangelical Lutheran Church in Tanzania. | Climate anxiety. | Hope.

2026

Contact: Beth E. Elness-Hanson, https://www.mamaanya.com/
Suggested citation: Joseph, Lais, Ezekiel Megiroo, and Suzana Sitayo. *Creation Care in Maasailand*. Edited by Beth E. Elness-Hanson. With Godson Abel Mollel and Knut Holter. Mama Anya, 2026.

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The Bishop's Blessing

It gives much joy and honor, having been entrusted in introducing *Creation and Care in Maasailand*, a work that speaks by itself whereby spiritual, culture, and environmental awareness embrace one another and therefore, compacted within Maasai community in their contextual setting. This work appears in real time with insightful aspects on traditional and spiritual aspects that give birth to the sustainable practices and livelihood that are essential in local and global context.

This multi-disciplinary work finds its roots in systematic and classical integration of biblical creation and care, Maasai traditional environmental knowledge, climate science and other sources within biblical, eco-theological frameworks, and it could not emerge without commitment, love, and the writers' own participation in the spiritual and life experience in Maasai community.

Through theological, cultural, ethnographic, contextual, environmental, and ecological consideration in Maasai sociocultural setting, this work brings to light an outstanding awareness, whereby societal ecological responsibility earns its significant consideration. Bishops, pastors, evangelists, church elders, policy makers, educators, practitioners, and participants in local-global contexts will find this work valuable and a credible source at hand. It paves more ways for meaningful reflections and practices that takes creation care more seriously and meaningfully, where spiritual, cultural, and conservation aspects are seriously considered and, therefore, strengthening these contextual and societal imperatives.

This work embraces critical thinking and takes the context seriously. It is readable, practical, and understandable for all the giraffes and the dik-diks.

One may not but admirably bless the facilitator of *Creation and Care in Maasailand*, a well-known and honored lady by the Maasai of Tanzania as she appears in Maasailand, whose nick name is (Mama Anya), by using the Maasai blessing: *Mikitamayana Engai* (God bless you).

With all my hearty thanks, appreciation, and salutation,

Rev. Dr. Godson Abel Mollel
Bishop of the ELCT North Central Diocese
Evangelical Lutheran Church in Tanzania

A Double Blessing

This book is part of a project on climate change mitigation in Maasailand. The book can be seen as a tangible and concluding result of this project. However, the book should not be taken as an end of the project. On the contrary, the lessons that are found throughout the book have a potential of being used in the time ahead. They can and should be used as tools for facilitating not only reflection around climate change mitigation in Maasailand but also corresponding action on grassroots level, such as in schools, churches, and other community groups.

Climate change mitigation is a topic that attracts much interest today, in Maasailand and beyond. Most projects and researchers, however, approach the question of climate change mitigation from typically sciences perspectives. It might therefore come as a surprise that the present project—now in the form of a book—approaches the challenges of climate change mitigation from perspectives that encourage Maasai reading communities—such as confirmation classes, women's Bible study groups, theological students, and secondary school students—to let traditional Maasai and biblical wisdom on creation care to interact.

If the approach of the project and book comes as a surprise, it may still exemplify the double blessing of letting traditional Maasai wisdom and practice on creation care interact with corresponding biblical wisdom. Both traditions honor the Creator and our responsibility for continuing creation care. So let us read the two together and then act accordingly!

Rev. Prof. Dr. Knut Holter
Project Supervisor at VID Specialized University, Norway,
NLA University College, Norway

Part 1:
Overview of the Creation Care in Maasailand Project

1. Overview of the Project that Developed these Lessons

A Blessing from Mama Anya

Growing up as a Lutheran pastor's daughter and as one who studied in Bible college, I was very familiar with the biblical concept of blessings. I recall my course in Genesis, where I learned that Abraham was blessed to be a blessing to all the people groups of the world (Genesis 12). This is a foundational text laying out God's mission of reconciliation of humans and all creation. Then, through faith in Jesus, we are grafted into this covenant, such that we are also blessed to be a blessing and be part of God's grace-filled work of reconciliation. Yes, I understood this in my *head*.

However, it was during my three years teaching at the MaaSae Girls Lutheran Secondary School in Monduli (2002–2004) that I began to glimpse how blessings were palpable in Maasailand, and this insight profoundly expanded my understanding. When the rains come, the Maasai say, "Ewo Engai" (God has come). The Maasai have helped me understand the power of blessings in all of life. I began to understand blessings with my heart.

Now, with this Marie Skłodowska-Curie postdoctoral research project, primarily funded by the European Union's research commission, I have the privilege of living out being a blessing with my hands—actually doing things together with many wonderful collaborators. I designed a project to be a blessing when developed together with the Maasai. In research language, this means "two-way transfer of knowledge" and "shared impacts." So, when I gathered a stellar group of Maasai Stakeholders to shape this project, I explained that I had come with an empty calabash (gourd), something that carries the true blessing of milk. This metaphor of a calabash makes sense in Maasailand where women milk the cows directly into gourds, providing the staple of the Maasai diet in a shared calabash for sustaining the life of the family. I came with a calabash—a framework for a research project—yet at the beginning, it was empty. I invited the Stakeholders to fill the calabash with the blessings of Maasai values and traditional wisdom. Then, these blessings would shape the project and be shared with the broader Maasai community. Blessed to be a blessing. (See more information on the Stakeholder role, p. 15.)

In a discussion with one of the Stakeholders, I said, "You help me be a better blessing; this work is shaped by your wisdom." Yes, I brought some resources, thanks to the funding of the EU research council, but as many know, resources can cause problems if used unwisely and do not address identified needs. The Stakeholders and other collaborators made these resources a blessing. So, I was surprised to read in a book on faith-based environmental activism that the red thread (theme) uniting all the essays was "tensions."[1] Providentially, this project was the opposite, characterized by eager participation (all accepted my invitation to be involved), respectful cooperation, and even shared joy, especially seen in Maasai music and dance. Ewo Engai! God has showered blessings upon this project, because the empty calabash was filled with Maasai values and wisdom. I am forever grateful. Asante sana. Ashe naleng'.

Mungu akubariki. /Mikitamayana Engai. / With blessings,
Mama Anya / Beth E. Elness-Hanson, PhD

[1] Jens Köhrsen, Julia Blanc, and Fabian Huber, eds., *Religious Environmental Activism* (Routledge, 2023).

Acknowledgements

I am profoundly grateful for the following people who have helped to facilitate this project and "fill my empty calabash (gourd)" with Maasai values and wisdom, as well as many other significant contributions (see p. 13). "I am because we are, and since we are, therefore, I am."

Rev. Bishop Dr. Godson Abel Mollel, North Central Diocese, Evangelical Lutheran Church in Tanzania
Rev. Prof. Dr. Joseph Parsalaw, retired Vice Chancellor, Tumaini University Makumira
Rev. Prof. Dr. Knut Holter, Supervisor, VID Specialized University, Norway

Stakeholders (see p. 15)
- Dr. Neema Kitasho
- Mrs. Sion Kereine
- Mr. Julius Laiser
- Rev. Ezekiel Lemaso
- CPA Elizabeth Loiruck
- Ms. Martha Ntoiopo
- Hon. Benedict Ole Nangoro
- Prof. Dr. Sarone Ole Sena
- Rev. Prof. Dr. Joseph Parsalaw
- Rev. Dr. Suzana Sitayo

Authors (see p. 16)
- Mwl. Lais Joseph
- Rev. Ezekiel Megiroo
- Rev. Dr. Suzana Sitayo

VID Specialized University, Norway
- Dean Vebjørn Horsfjord
- Prof. Tomas Sundnes Drønen
- Prof. Daniela Rapisarda
- Prof. Rebecca Solevåg
- Ms. Maria Tendenes

Core Collaborators and Support
- Office Management Secretary Joyce Felix Mshanga, Vice Chancellor's Office, Tumaini University Makumira
- Rev. Dr. Seth Mesiaki Ole Sululu, Principal, Makumira Training Institute
- Dr. Daniel Kosia Mokoro, Translator, Statistics Analyst
- Mr. Joseph Kosia, Research Assistant, Translator
- Deputy Principal for Administration Randall Stubbs, Makumira Training Institute, and Director, Cultural Arts Centre
- Deputy Principal for Academics Emmanuel Athanas Ndale, Makumira Training Institute
- Assistant Director Gloria Kileo, Cultural Arts Centre
- Nacco and Imani at Khaki Media Pro
- Mr. Goodluck Natai
- Ms. Laurie Meyer
- Dr. Elenn′ Parrish

Fieldwork Sites

MaaSae Girls Lutheran Secondary School
- Head of School Tulizael Marco Mbise
- Mwl. Lais Joseph
- Matron Elisifa Mollel
- Student research participants and choirs

Moringe Sokoine Secondary School
- Head of School Lazaro Ndooki
- Mwl. Yona Mollel
- Student research participants and choirs

Amazing Grace Widows and Orphans
- Founder and CEO Winny Ene Sirikwa
- Research participants

Asasi Ya Naapok (Naapok Bead Project, CBO)
- Mrs. Bethany Friberg, Lutheran missionary, research project facilitator at *Asasi Ya Naapok*
- Naapok artisan research participants

Kibaya Lutheran Church
- TEE research participants

Wasso Lutheran Church
- TEE research participants

Olchoroonyokie Village
- Mwinj. Raphael Sitelu Laiser
- Rev. Magilani Lesion Molell
- Chairman Silas Loiruk Laiser, Olchoroonyokie
- Choir director Abel Zephania Molell
- Student research participants and choirs

Lendikinya Lutheran Church
- Mwinj. Seth Nnko
- Student research participants and choir

Monduli Special Guests
- Monduli District Office Environmental Officer, Isaack Urassa
- District Pastor Gervas Meitamei
- Retired District Pastor Joel Nangole
- Fr. John Maendeleo

Research Project Background and Funding

This is part of a Marie Skłodowska-Curie postdoctoral research project facilitated by Dr. Beth E. Elness-Hanson ("Mama Anya"), a former volunteer teacher at the MaaSae Girls Lutheran Secondary School (MGLSS) in Monduli, Tanzania, for three years (2002–2004).

The research was funded primarily by the European Commission (European Union) and partially funded and managed by VID Specialized University, Stavanger, Norway, with supervisor, Rev. Prof. Dr. Knut Holter. The Tanzanian local partner was Rev. Prof. Dr. Joseph Parsalaw, who was then Vice Chancellor at Tumaini University Makumira, Usa River, Tanzania. All the Stakeholders, writers, and other collaborators were compensated for their services in alignment with Tanzanian government established rates.

Stakeholders and Other Core Collaborators

The project began by receiving a blessing by Rev. Bishop Dr. Godson Abel Mollel with permission to engage the research in the North Central Diocese of the Evangelical Lutheran Church in Tanzania (ELCT).

Then, a stellar Maasai Stakeholder Group served as the advisory council, meeting twice in Arusha. This group shaped the research by:

- Determining the core Maasai values for the overall project;
- Establishing the learning outcomes for the lessons; and later,
- Evaluating the draft lessons in accordance with the established values and learning outcomes.

The Maasai Stakeholders

These Stakeholders graciously shared their traditional knowledge and expertise:

- Dr. Neema Kitasho, environmental scientist, Lecturer at Sokoine University of Agriculture
- Mrs. Sion Kereine, a leader at *Asasi Ya Naapok* (Naapok Bead Project, CBO), Ketumbeine council member from 2005–2015
- Mr. Julius L. Laiser, CBNRM, Natural Resources Management specialist, Technical Advisor for LOKEEN-Natron, and Co-Lead Implementing Person for the Faith for Restoration Project (4FR) funded by CKU in collaboration with WWF, RECODDA and LOKEEN.
- Rev. Ezekiel Lemaso, Senior Pastor of Ilkiranyi Parish of ELCT North Central Diocese; Lecturer and Deputy Principal (formerly Academic Officer) at Oldonyosambu Theological College; North Central Diocese representative for this project appointed by the bishop.
- CPA Elizabeth Loiruck, Deputy Principal for Planning, Finance, and Administration at the Arusha Lutheran Medical Training Centre and Director and Founder of TAA Finance
- Ms. Ntopoi Martha, environment planning and management
- Honorable Benedict Ole Nangoro, retired Minister of Parliament representing Kiteto who served as the Deputy Minister of Livestock Development and Fisheries
- Prof. Dr. Sarone Ole Sena, Professor and Deputy Vice Chancellor in charge of academic affairs at the International Leadership University, Kenya
- Rev. Prof. Dr. Joseph Parsalaw, retired Vice Chancellor of Tumaini University Makumira, local research partner
- Rev. Dr. Suzana Sitayo, Lecturer at Tumaini University Makumira and Principal of Oldonyosambu Theological College

About the Authors

Mwalimu Lais Joseph: Secondary School Lesson Writer and Teacher

Mwalimu (Teacher) Lais Joseph is an advanced level teacher with expertise in biology and geography. He was located at the MaaSae Girls Lutheran Secondary School at the time of the writing and teaching of the lessons there. He intersected his natural science competence with his Indigenous Maasai knowledge in the development of these lessons. This breadth of knowledge is applied through his honed skills as an effective educator, demonstrated in the lesson writing and his instruction of them. His knowledge and pedagogical skill are demonstrated also in the cleaver coalescing of these aspects with biblical creation care messaging developed in collaboration with Rev. Megiroo. The prayer at the end of Lesson 1, Chapter 12, is a beautiful example of the value he brought to this project.

*Rev. Ezekiel Megiroo: Confirmation/*Kipa Imara *Lesson Writer and Teacher*

Rev. Ezekiel Megiroo is a Pastor at Evangelical Lutheran Church in Tanzania, North Central Diocese. He is the pastor in charge of the Monduli Lutheran Parish and former instructor at Oldonyosambu Theological College. With responsibility over worshipping sites and the confirmation program in each location, Rev. Megiroo has developed and taught the lessons for the confirmation ministry. These lessons become an important resource for the entire North Central Diocese and other Maasai contexts. With further developments beyond this project, Rev. Megiroo has initiated the Monduli Parish Youth Campaign on Creation Care. He continues as a vanguard of biblical ecojustice and a resource for the ELCT.

Rev. Dr. Suzana Simon Sitayo: TEE and Women's Bible Study Groups Lesson Writer and Teacher

Rev. Dr. Suzana Simon Sitayo is a Tanzanian theologian, ordained minister, and academic serving the Evangelical Lutheran Church Tanzania. She holds a PhD in Religious Science, with a master's degree in missiology. She has been a Lecturer at Tumaini University Makumira since 2018 and supervises undergraduate and master's research. Alongside her university role, she has served as College Principal of Oldonyosambu Theological College (OTC) for training lay pastors (called evangelists in the ELCT) who are trusted local leaders and teachers in the church. Thus, she is the author of these lessons for the TEE (Theological Education by Extension) students at OTC.

Other Collaborators

Rev. Dr. Seth Mesiaki Ole Sululu

Rev. Dr. Sululu is Principal of the Makumira Training Institute. He is also a lecturer at both the Faculty of Theology and Faculty of Education, Humanities, and Science at Tumaini University Makumira since 2012. He is a leading expert on Maasai music, holding a PhD in ethnomusicology from University of Hildesheim, Germany. He graciously served as the adjudicator for the special choir competitions that integrated main teaching points into traditional Maasai tunes. He also was the managing producer of the music videos sung by the winners of the music competitions.

Dr. Daniel Kosia Mokoro

Dr. Kosia is a Senior Education Lecturer at Tumaini University Makumira where he is an instructor for research methods, educational assessment, and statistics courses. He provided statistical analysis expertise for the data analysis of the 11,240 data points collected in the pre-, post-lesson, and longitudinal surveys. In addition, he provided the final Maa translation language review. Moreover, Dr. Kosia is a mentor for Mama Anya with her ongoing development of understanding of the Maasai.

Mr. Joseph Kosia

Mr. Kosia was engaged as the research assistant for this project. He was the principal facilitator of the orientation and survey data collection during the fieldwork. His multifaceted support and strategic help included the primary Maa language translation of surveys and the lessons, bringing his enthusiasm, diligence, and trustworthiness into every task.

About the Lessons

The Lesson Development Process

After the Stakeholders developed the core Maasai values and established the learning outcomes (see p. 11), three Maasai writers worked with these guidelines and developed three lessons for each of the following four groups.

Lesson Groups	**Author**
Confirmation/*Kipa Imara*	Rev. Ezekiel Megiroo
Secondary education in Diocese owned institutions	Mr. Lais Joseph
Women's Groups	Rev. Dr. Suzana Sitayo
Theological education by extension (TEE) training for lay pastors (called evangelists in the ELCT)	Rev. Dr. Suzana Sitayo

Collaborative Writing

The overall coherence of the content developed by three different writers writing was primarily shaped by the core values and learning outcomes—such as the main point for each lesson—that the Stakeholders had established. Yet, some content is distinct, as it includes the writer's perspective that was curated for their own target group. In addition, there was collaboration in the writing process that supported cohesion. For example, Dr. Sitayo shared early versions of her lessons with the other writers. Rev. Megiroo and Mr. Joseph met and worked together to share their expertise of biblical theology and natural science respectively. They also collaborated with an initial test of a lesson with confirmation student groups. Furthermore, Mama Anya supported the development of the lessons through providing the writers with the lesson plan template; pedagogy training on active learning and integrating cognitive, affective, and behavioral learning outcomes; as well as providing resources on ecotheology and climate change information related to a Maasai or pastoralist context that could be appropriated for their lesson development. These aspects helped to develop core coherence for the project.

The writers revised the lessons twice. First, the writers made revisions after feedback of their draft lessons from the Stakeholders. The Stakeholders evaluated the lessons according to the core values and learning outcomes that they established at the beginning of the project in the first Stakeholder meeting. In this second Stakeholder meeting, the Stakeholders worked in small groups to review the draft lesson content from their expertise and competencies: 1) Bible and theology; 2) Maasai traditional knowledge and anthropology; 3) climate science and environmental studies; and 4) hope within a Maasai context. The writers made the final content revisions after statistical analysis of surveys that were part of Mama Anya's research aspect of this project.

The Research Project

Mama Anya developed a survey, reviewed by the lesson writers and two professors of research methods, to identify knowledge and attitudes related to the four lesson themes: 1) biblical creation care, 2) Indigenous environmental knowledge, 3) climate science, and 4) hope (see p. 19). All surveys were taken anonymously in alignment with international research ethical standards. Ethical reviews include:

- The Data Protection Services of Sikt—the Norwegian Agency for Shared Services in Education and Research (Reference # 484011).
- The Tanzania Commission for Science and Technology (COSTECH) (Project reference: CST00000053-2023).

The participants took the surveys *before* the lessons to determine the baseline understanding of the participants. *After* the instruction of the lessons in a half-day seminar format, the participants took the same survey again. *After several weeks*, the participants took the same survey for the third and final time. The surveys demonstrated what knowledge and attitudes developed through participating in the lessons and how these developments were sustained, or not, over several weeks.

The detailed description of the research project appears in a book written by Mama Anya (Beth Elness-Hanson), *Creation Care and the Church in Maasailand: Leveraging Underutilized Resources in Response to the Climate Crisis* (proposed title, forthcoming 2026). This book describes the theoretical frameworks, research design, ethical reviews, methods, the survey, and the statistical analysis of the survey data with more detail, as well as an examination of how this model of creation care contributes to the scholarship and practice of faith-based climate activism. Some more public interest information of the research appears at https://www.mamaanya.com/. The website also provides all the lessons printed in this book for downloading without cost. The introduction iin this volume provides only a summary of the research which helps the reader to understand the larger postdoctoral research project.

Three Languages

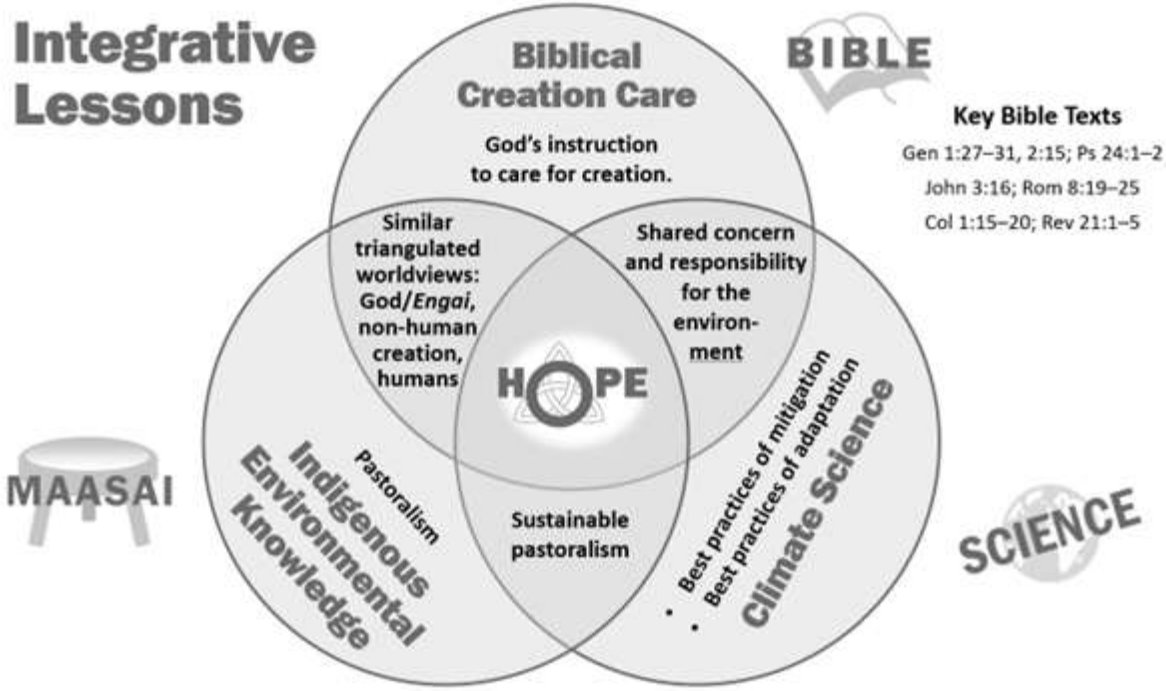
The lessons were originally written in English. According to the group for which the lessons were developed, the lessons are published in one or two languages. Secondary education in Diocese owned institutions is English medium. Thus, the lessons here are only in English. The Theological Education by Extension (TEE) training for lay pastors (called evangelists in the ELCT) is primarily taught in Kiswahili. Thus, the lessons appear in parallel columns of English and Kiswahili. For both the confirmation groups and the women's groups, it is prudent to have a Maa translation. For the translations, there were two steps of an initial translation and a following check and revision of the translation. The native Maa language speakers who worked diligently on the Maa translation are Dr. Daniel Kosia Mokoro and Mr. Joseph Kosia.

One of the challenges in presenting climate science terminology in Maa was that these are new and rather technical concepts to render into a language without existing terminology. There were three native Maa speakers who all have advanced education in environmental management and/or climate science who checked and developed the Kiswahili vocabulary as well as developed and revised the Maa vocabulary used for this project (see Appendix A). This project is indebted to this crucial contribution of these three experts: Dr. Neema Kitasho, Mr. Julius Laiser, and Mr. Lashumbai Kilolong in collaboration with the Maa translators, Dr. Daniel Kosia Mokoro and Mr. Joseph Kosia.

Engai or Enkai?

The Maa language has several dialects and some variations in spelling. For example, the word for God in Maa has two spellings: *Engai* or *Enkai*. In this collection of essays, the writers had their own preferences for the spelling, thus, both *Engai* or *Enkai* appear in the following lessons. Other Maa language spellings are established by the translators according to their Monduli and Ketumbeine area contexts.

Integrative Lessons



It is undeniable that increasing extreme weather events, changing rainfall patterns, and other environmental degradations have dramatically impacted the traditional Maasai, whose pastoralist livelihoods are dependent upon natural resources.

With these concerns, three Maasai writers—guided by Maasai Stakeholder values and learning outcomes—developed three lessons that enable the community to face the challenges arising from climate change. These lessons are designed to empower the Maasai with biblical, scientific, and practical knowledge to expand the enduring Indigenous environmental knowledge of the Maasai. In addition to knowledge, the lessons include opportunities to enliven motivation for working together and making a difference—engaging the future with hope—as we are commissioned to care for God's good creation.

There are main points for each of the three lessons that determine the majority of each lesson's content. Each lesson integrates previews of the next lesson and subsequent lessons, while also reviewing key concepts from previous lesson (see the illustration). The lessons' main points are:

1. **Biblical creation care:** God has commissioned (instructed) us to care for God's good creation. In this lesson, we see how texts in the Bible teach us that God has entrusted us to be part of God's work. The creation care lessons—the first lesson for each group—represent a general summary of common biblical and ecotheological viewpoints. These lessons are examples from the voices of the writers and do not claim to be the only way of approaching creation care. Additional perspectives and insights are found in the Resources for Lesson 1 in Chapter 15.

2. **Indigenous environmental knowledge:** The Maasai worldview—of the interdependence between humans, the environment, and Engai—is similar to Bible's "creation triangle" (see p. 45). In this lesson, our Maa community will affirm our Indigenous skills of managing our ancestral land and learn about how our good traditions align with climate science.
3. **Integrating climate science**—that is appropriate for a Maasai context—can help prevent global climate change as well as prepare for the local challenges faced now. In this lesson, our Maa community will expand our knowledge in caring for creation, by not only supporting Maasai traditions but also appropriating science research that explains the best practices of climate change mitigation (reducing the causes of climate change) and adaptation (reducing the risks of the negative effects of climate change).
4. **Hope:** Each lesson wraps up with hope shared from the Bible, Maasai wisdom, and the climate scientists.

Explore the lessons in this volume and discover how each author engaged these main concepts for their group.

Website

These printed lessons can also be found online in a PDF form at https://www.mamaanya.com/.
They are free to download and use to be a blessing with the same Creative Commons license CC BY-NC-SA: Attribution-NonCommercial-ShareAlike (see the colophon/publishing information at the front of this book).

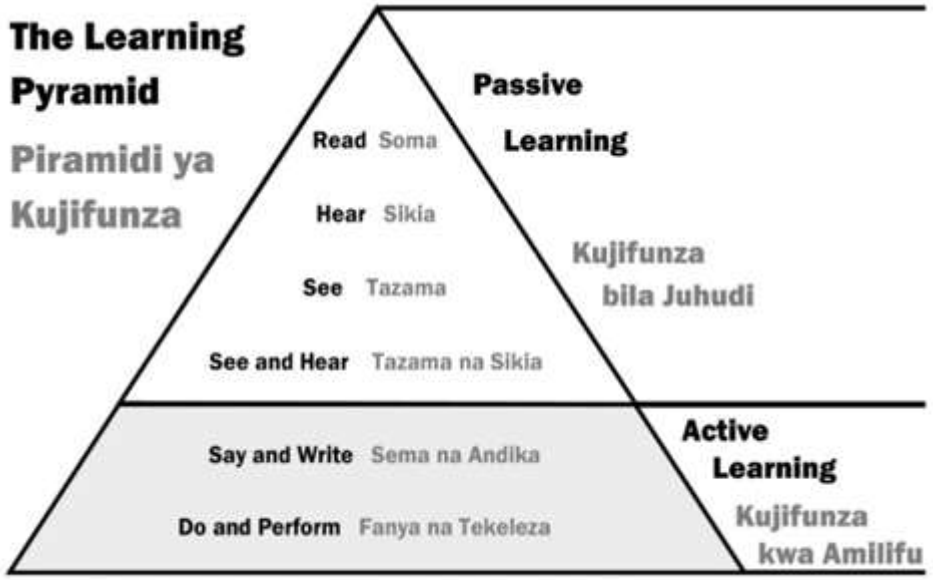
2. Teaching Tips for Teachers

English

- **Adaptable:** These lessons are examples. The Maasai writers wrote the lessons for different groups. Teachers can adapt the lesson plans for other contexts by adding or removing aspects.
- ***Italics:*** *Words in italics* in the lesson plans are instructional information for the teacher.
- **Active learning:** Active learning methods have stronger learning outcomes rather than lecturing. The most effective and memorable learning happens through methods, such as saying, writing, doing, and performing.
  - This includes small group discussion and exercises where the participants are reflecting upon the concepts and putting them into their own words.
  - Small groups are more productive when there are groups of two to three participants in a group, so that each has an opportunity to speak in short reflection times.

Kiswahili

- **Inayoweza Kubadilika:** Masomo haya ni mifano. Waandishi wa Wamaasai waliandika masomo kwa makundi tofauti. Walimu wanaweza kurekebisha mipango ya masomo kwa muktadha mwingine kwa kuongeza au kuondoa vipengele.
- ***Italiki:*** *Maneno yaliyoandikwa kwa alama za* italiki katika mipango ya somo ni taarifa za mafundisho kwa Mwalimu/mfundishaji



This adapted concept was originally developed by Edgar Dale.

- **Kujifunza kwa ushirikiv** Mbinu za kujifunza kwa vitendo/ushiriki zina matokeo bora ya kujifunza badala ya kutoa mihadhara. Kujifunza kwa ufanisi na kwa kumbukubmu zaidi hutokea kupitia mbinu, kama vile kusema, kuandika, Kutenda, na kufanya vizuri.
  - Hii inajumuisha majadiliano na mazoezi ya vikundi vidogo ambapo washiriki wanatafakari dhana na kuziweka kwa maneno yao wenyewe.
  - Vikundi vidogo vina tija zaidi wakati kuna vikundi vya washiriki wawili hadi watatu katika kikundi kimoja, ili kila kimoja kipate fursa ya kuzungumza kwa muda mfupi wa kutafakari.

- **Singing as a pedagogical strategy:** In several of the lessons in this book, the writers have encouraged an application ("Took") activity where small groups of students work together to turn the main point of the lesson into a verse that they write in order to sing it with a traditional Maasai song tune. This is a strong pedagogical strategy for many reasons. First, it reviews the main point of the lesson. Second, music is a great way to remember, because singing involves using more and different brain functions. Third, putting the content into their own words is an important part of reflective learning. Furthermore, putting words to a traditional Maasai tune is not only an effective use of limited lesson time, but it also affirms the Maasai culture. Yes, singing is an important pedagogical strategy, but it will take some time. Try to allow 15-minutes in the lesson time, or perhaps, the students can be given an assignment to work on after class and bring back to the next lesson. This would also provide review of the first lesson before the next lesson begins.
- **Minute markings:** Minutes for each activity are suggested in the far-left column to fit into a 60-minute lesson. These can be adapted according to your available time.
- **A lot of information in the lesson plans:** There is a lot of information in the lesson plans. It may be difficult to include all the information in one 60-minute lesson. Some information is provided to have the core lesson content available for the teachers of the lessons.
- **Lessons for four different groups:** Teachers can compare the lessons from the four different groups for other ideas to see how another writer had developed lesson plans for their specific group.
- **Collected resources in the last three chapters:** Additional information appears in the last three Resource chapters: 15, 16, and 17. All the authors contributed to collecting resources, which were combined at the end of the book. These are resources to expand the teacher's understanding, but there is too much detail that is beyond the scope of each lesson. The intent is that teachers can read through these resources to be better equipped for teaching the lesson plan without having to do independent research.

- **Kuimba kama mkakati wa ufundishaji:** Kwa masomo kadhaa katika kitabu hiki, waandishi wamehimiza shughuli ya matumizi ("Took") ambapo vikundi vidogo vya wanafunzi hufanya kazi pamoja ili kugeuza hoja kuu ya somo kuwa ubeti ambao wanaandika ili kuiimba kwa ala/sauti ya nyimbo ya kitamaduni ya Wamaasai. Huu ni mkakati imara wa ufundishaji kwa sababu nyingi. Kwanza, unapitia hoja kuu ya somo. Pili, muziki ni njia nzuri ya kukumbuka, kwa sababu kuimba kunahusisha kutumia kazi nyingi zaidi na tofauti kwenye ubongo. Tatu, kuweka maudhui katika maneno yao wenyewe ni sehemu muhimu ya kujifunza kwa kutafakari. Zaidi ya hayo, kuweka maneno kwenye wimbo wa kitamaduni wa Wamasai si tu matumizi bora ya muda mdogo wa somo, lakini pia inathibitisha utamaduni wa Wamasai. Ndiyo, kuimba ni mkakati muhimu wa ufundishaji, lakini itachukua muda. Jaribu kuruhusu dakika 15 katika muda wa somo, au labda, wanafunzi wanaweza kupewa kazi ya kufanya baada ya darasa na kuiwasilisha watakaporudi kwenye somo linalofuata. Hii pia itatoa mapitio ya somo la kwanza kabla ya somo linalofuata kuanza.
- **Alama za dakika:** Dakika za kila shughuli zinapendekezwa katika safu wima ya kushoto ili kuendana na somo la dakika 60. Hizi zinaweza kubadilishwa kulingana na muda uliopo.
- **Taarifa nyingi katika mipango ya somo:** Kuna taarifa nyingi katika mipango ya somo. Inaweza kuwa vigumu kujumuisha taarifa zote katika somo moja la dakika 60. Kuna baadhi ya taarifa hutolewa ili kubaki na maudhui ya msingi ya somo yanayopatikana kwa urahisi kwa walimu wa masomo.
- **Masomo kwa makundi manne tofauti:** Walimu wanaweza kulinganisha masomo kutoka kwa makundi manne tofauti kwa mawazo mengine ili kuona jinsi mwandishi mwingine alivyotengeneza mipango ya somo kwa ajili ya kundi lao.
- **Rasilimali zilizokusanywa katika sura tatu zilizopita:** Taarifa za ziada zinaonekana katika sura tatu zilizopita za Rasilimali: 15, 16, na 17. Waandishi wote walichangia kukusanya rasilimali, ambazo ziliunganishwa mwishoni mwa kitabu. Hizi ni rasilimali za kupanua uelewa wa mwalimu, lakini kuna maelezo mengi sana ambayo yako nje ya upeo wa kila somo. Kusudi ni kwamba walimu waweze kusoma rasilimali hizi ili wawe na vifaa bora vya kufundisha mpango wa somo bila kulazimika kufanya utafiti wa kujitegemea.

Part 2:
Lessons for Diocese Secondary Schools
(English)

12. Secondary School Lesson 1: English

Biblical Creation Care

Main Point	 **Biblical principles of creation care are affirmed by traditional Maasai environmental knowledge, both of which align with climate science, which extends knowledge to equip us for caring for God's creation.**
Learning outcomes	As a result of this lesson, the learner will:
Cognitive: Know 	**Bible** • Understand the concept of creation care. o Define creation care and explain its importance in both religious and ecological contexts. o Identify key biblical scriptures that support the idea of humans as caretaker of God's creation. o As Christians, we are called to take **responsibility** for **environmental care** as an expression of our love for God.  **Maasai** • Identify biblical principles related to creation care and recognize their relevance in the Maasai cultural context. • Maasai sustainable practices align with **biblical teaching** about respecting and caring for God's creation.  **Climate Science** • Climate science helps us understand why the planet is warming, the impacts of climate change, and what we can do to protect the environment.  **Hope** • There is hope for the future, knowing that when we care for the earth, we participate in God's plan to restore and renew all of creation, bringing peace and balance to the world. 
Affective: Feel 	Students will reflect on their position in God's creation. • **Appreciation:** Develop an appreciation for the Maasai community's sustainable practices and their alignment with biblical teachings. • **Responsible:** Cultivate a sense of responsibility towards environmental caretaker and creation care.

Behavioral: Do

- Ask students to identify future projects for applying creation care to everyday actions and engaging in practical projects that align with biblical teachings about caring for God's creation.
- Or have the students put into their words how these projects are part of God's commission to care for creation.

Teaching Equipment Needed	Student Supplies/ Handouts
• Whiteboard and markers or chalkboard and chalk • Have the Earth and sun pre-drawn on board ready to fill in with the blanket effect (to save time) • Projector and screen (optional)	• Bibles • Bible passages (may be written on whiteboard/chalkboard)

See Resources Chapter 15 and 17

Time	Content

3 Picture a Maasai elder standing at dawn, overlooking the sprawling savannah, where each blade of grass, every wild animal, and the very soil beneath. For centuries, the Maasai have lived in harmony with this land, understanding the delicate balance of nature. This is much like the biblical mandate in Genesis that calls humanity to "tend and keep" or "serve and keep" the Earth.

- But what happens when this balance is threatened?
- Is it that the consequences are deeper than dry riverbeds or dwindling herds? The very relationship that has sustained both the Maasai and the land for generations begins to strain. What was once a partnership now becomes a struggle. Thus, in these moments of imbalance, the biblical call to "tend/serve and keep" becomes not just a gentle instruction but an urgent reminder. Creation care was never really an option—it is a moral responsibility.

Transition statement (connecting Hook to Main Point)

1
- The timeless principles of creation care, so deeply rooted in both Maasai tradition and the Bible, guide us in restoring harmony with the earth today.
- Just as the Bible emphasizes the need to maintain the balance of nature, the Maasai people understand that their survival depends on living in harmony with their environment caring for the land, preserving wildlife, and ensuring that resources are used sustainably.
- With this understanding of the deep connection between Maasai traditions and biblical teachings, let us now deepen our understanding and explore how we can apply these principles of creation care in our daily lives.

Biblical Foundation for Creation Care

15 ***Definition of Creation Care:*** *The act of responsibly managing and protecting the environment based on religious and ecological principles. Creation Care refers to the practice of managing and protecting the natural environment based on the belief that the Earth and its ecosystems are God's creation. This concept emphasizes the responsibility of humans to steward the Earth wisely and sustainably, ensuring that natural resources are preserved and protected for future generations. Creation care involves actions that promote environmental sustainability, such as reducing waste, conserving water, protecting wildlife, and addressing climate change. It is rooted in the biblical mandate for humans to "serve and keep" the Earth (**Genesis 2:15**) and acknowledges that all creation reflects God's glory (**Psalm 19:**1).*

Students, in groups of 2 or 3, are given one of the following texts: ***Genesis 1:31, Romans 8:19–22****.*

The students read their text and are asked to discuss it in their small groups with the following questions:

- What does this Bible verse say about God's creation?
- What does this Bible verse say about the relationship between humans and God's creation?

Reporters from two or three groups are invited to share their discoveries for each Bible text.

Notes to support the discussion:

- **Genesis 1:31**, "God saw all that he had made, and it was very good."
  - God is the creator. God's creation is good.
  - This verse reflects the initial state of harmony in creation, where everything is in ordered and functioning as intended by God.
- **Romans 8:19–22**, "For the creation waits in eager expectation for the children of God to be revealed... that the creation itself will be liberated from its bondage to decay and brought into the freedom and glory of the children of God."
  - This verse talks about a time when the natural world will be set free from decay and brokenness caused by sin.
  - It shows how the healing of people through God's redemption is closely connected to the healing and renewal of all creation.

God's Charge to Care for Creation (Key Point!)

The Bible emphasizes that humans are entrusted with the care of the earth. **Genesis 2:15.** "The Lord God took the man and put him in the Garden of Eden to work it and take care of it." The Hebrew word often translated as "work" or "tend" also means "serve," which indicates the responsibility to minister to the creation and not mastery over it.

Human Responsibility and Disobedience

- In **Matthew 22:37–39**, we see that Jesus teaches the two greatest commandments:
  - **Love God** with all your heart, soul, and mind.
  - Love your neighbor as yourself.
- If we think about climate change and environmental destruction, we can see these as being a result of failing to love what God loves: God's creation and our neighbors.
  - **Loving God's creation**: God created the earth and called it **good** (**Genesis 1:31**). **Environmental destruction** (like pollution, deforestation, and actions that cause climate change) is a **failure to honor and care for** God's creation, showing a lack of love for what God has made.
  - **Loving our neighbors**: The effects of climate change hurts people, and Africans will be some of the most impacted by the climate crisis, because most Africans are dependent upon the natural resources for their livelihoods.

Living out the call to stewardship

James 2:26 reminds us that "faith without works is dead."

- Applying this to creation care, it suggests that our belief in the importance of stewardship must be accompanied by real actions.

The Maasai

- The Maasai have traditionally practiced sustainable living, recognizing that their well-being is directly tied to the health of the environment. For instance, their pastoral lifestyle revolves around the careful management of grazing lands to prevent overuse, reflecting a deep understanding of the need to preserve the natural balance. Livestock are rotated between grazing areas, such that each area gets time to rest and regrow. Rotation prevents overgrazing and land degradation (see p. 214).
- However, **climate change** poses a significant threat to this balance, disrupting weather patterns, depleting natural resources, and challenging the traditional Maasai way of life.

Climate Change Introduction

10 *Lesson 3 is the primary lesson on the science of climate change, but an introduction is provided here.*

Climate Change Definition (Key point!)

- Climate change refers to long-term changes in temperature, precipitation, wind patterns, and other aspects of the Earth's climate system.
  - It **includes both natural processes** and **human activities** that change the Earth's climate over extended periods.
  - This is a **natural process** that keeps the Earth warm enough for life.
  - However, **human activities** like burning fossil fuels (oil, coal, gas, plastics) and cutting down trees release extra Earth-warming gases into the air.
  - This causes the Earth to trap **too much heat**, leading to **global warming** and **climate change**, called the **"greenhouse effect."** It can also be called the **"blanket effect,"** which may be a more understandable metaphor. **Blankets keep warmth in.** (See the image on the back cover.)

The Blanket Effect (Greenhouse Effect) (Key point!)

- The **blanket (greenhouse) effect** is a natural process that warms the Earth's surface.
  (See the back cover of this book for an illustration. Draw the basic image on the chalkboard.)
  - It happens when certain gases in the atmosphere, known as **greenhouse gases (GHG) or global-warming gases**, trap heat from the sun.
  - This leads to **climate change**, with effects like higher temperatures and stronger storms.

Primary Sources of Climate Change (Key point!)

- The primary **global-warming gases or greenhouse gases (GHG)** that cause the blanket (greenhouse) effect are:
  - **Carbon Dioxide (CO_2):** The burning of fossil fuels (such as coal, oil, and natural gas) for energy and transportation is the largest source of CO_2 emissions. Deforestation, which reduces the number of trees that can absorb CO_2, also contributes significantly.
  - **Methane (CH_4):** Methane is released during the production and transport of coal, oil, and natural gas. It is also emitted by livestock during digestion and by landfills where organic waste decomposes.
  - **And others** (more information in lesson 3).

Climate Change and Impacts upon the Environment

However, the imbalance in nature, primarily driven by **human-caused global-warming gases**, leads to the following:

- **Increased temperatures**: Human activities—like burning fossil fuels—release CO_2 and other global-warming gases into the atmosphere, trapping heat, and causing global temperatures to rise.
  - This disrupts natural climate patterns and leads to more frequent and severe weather events.

- **Changing rainfall patterns:** With climate change, rainfall patterns have become more erratic, leading to droughts or floods, which disrupt the availability of pasture and water.
  - The Maasai rely on predictable seasonal rains for grazing their livestock.
  - This directly threatens the survival of their herds, which are central to Maasai culture and economy.
- **Extreme weather events**, like floods or droughts can damage the environment, further upsetting the natural balance.
- **Ecosystem disruption**: Higher temperatures and altered precipitation patterns affect ecosystems, leading to habitat loss, species migration, and changes in food chains.
- **Resource depletion:** Increased temperatures and prolonged droughts contribute to the degradation of the natural resources.
  - With grazing lands ruined by overgrazing, the Maasai people need to take cows farther to graze in distant lands to find adequate pasture.
- **Loss of biodiversity:** As the climate shifts, some species that are vital to the natural ecosystems may become endangered or extinct.
  - This loss of biodiversity disrupts the delicate balance of nature that the Maasai have long maintained, affecting everything from grazing patterns to the availability of medicinal plants.
- **Ocean changes**: Warming temperatures and increased CO_2 levels result in ocean warming and acidification, which damage marine ecosystems, including coral reefs.
- **Melting ice and rising seas**: The warming climate causes glaciers and ice caps to melt, contributing to rising sea levels. This disrupts coastal ecosystems and threatens human and wildlife communities.

More bad effects upon humans and health will be discussed in lessons 2 and 3.

The Impact of Climate Change on the Maasai Context

8

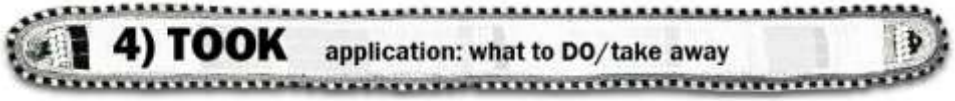
- For the Maasai, climate change is experienced as significant shifts in weather patterns that impact their traditional way of life.
  - In Maasai land, climate change means changes in weather patterns, like less rain, more droughts, and unpredictable seasons.
  - These changes make it harder to find water and grass for their animals.
- The Maasai see this as both a spiritual issue linked to *Engai*, and a result of human actions.
  - The Maasai people believe that *Engai* controls nature, including rain and weather. They see problems like droughts and unpredictable rains as a sign that *Engai* might be unhappy.
  - However, they also recognize other causes of climate change as result of human actions. These include cutting down trees, overusing the land, and modern activities like pollution and farming on grazing lands. Losing their traditional ways of caring for the land, like rotating grazing areas, also contributes to the problem.
  - So, while *Engai* is important in their beliefs, the Maasai understand that human actions also play a big role in climate change.

- In the Maasai context, the biblical principles are naturally mirrored in their traditional practices. The Maasai people have long recognized that their survival is intertwined with the health of the environment. Their rotational grazing practices, which allow land to recover and regenerate, reflect an understanding that aligns with the biblical call to stewardship—caring for the earth in a way that sustains its ability to provide for future generations.
- For the Maasai, the balance of nature is central to their way of life. When this balance is disrupted—whether by overgrazing, climate change, or other factors—it impacts not just the land but the entire community. In this light, creation care is a way of restoring harmony to their environment, ensuring that their land, animals, and people can thrive in harmony.

LOOK Continued: Hope

3 **Matthew 6:26**: "Look at the birds of the air; they do not sow or reap or store away in barns, and yet your heavenly Father feeds them. Are you not much more valuable than they?"

- This verse reminds us that God cares for all creation, offering hope that God will continue to care for the world, even in the midst of the challenges of climate change.
- The hope we have in creation care is grounded in the sovereignty of God. God promises restoration!
- By embracing this hope, we can approach environmental challenges with confidence, knowing that our efforts are part of a larger divine plan for the redemption and renewal of all creation.
- Our hope empowers us to take action, work together, and invest in future generations, trusting that God is at work in and through us to mitigate and adapt.



Activity

3 Creation care is a holistic approach that involves spiritual, communal, and practical actions to maintain the balance of nature.

- From the Maasai, we learn that living in harmony with the environment is not just about survival, but also it is about fulfilling a divine responsibility to protect and nurture the earth.
- By embracing stewardship in our daily lives, advocating for environmental justice, and engaging in community-based conservation, we can contribute to a more sustainable and harmonious world, honoring both God and the planet we call home.

In your group of students:

- Ask students to identify future projects for applying creation care to everyday actions and engaging in practical projects that align with biblical teachings about caring for God's creation. For example: making compost bins, creating recycled art, or designing sustainable gardens.
- Or have the students put into their words how these projects are part of God's commission to care for creation. For example: In **Colossians 1:16–17**, we are reminded that all things were created by God and are meant to be cared for.

Write a Verse to a Song

15 Write the first verse of a song about God commissioning us to care for God's good creation to a traditional Maasai tune. Take a traditional Maasai tune and write new words based on this lesson.

Provide as much time as possible to work on writing a song verse. At the end of the time:

- Can we have 2 or 3 groups share their verse with us? Only volunteer if you are ready and can sing it without much delay.
- You may keep working on your verse after the class.
- In the following 2 lessons, you will also add one verse for each of the 2 lessons. So, this project will continue to develop.

Prayer

2 God the Creator, *Engai eushumata*,

We come before You with hearts full of gratitude for the beauty and diversity of Your creation. We thank You for the Maasai people and their deep connection to the land, a connection that reflects the very balance and harmony You intended for all of nature.

Lord, we recognize that You have called us to be stewards of this earth, to care for the land, the animals, and all living things. We ask for Your wisdom and guidance as we seek to honor this responsibility. Help us to learn from the Maasai's example, living in harmony with the environment and respecting the delicate balance of nature that sustains us all.

As we face the challenges of climate change and environmental degradation, we pray for strength and perseverance. Grant us the courage to make the changes necessary to protect Your creation. May we advocate for justice, support those most affected by environmental harm, and take tangible steps to restore the earth to the wholeness You desire.

We pray for the Maasai community and all indigenous peoples who are on the front lines of environmental stewardship. Protect their lands, preserve their traditions, and bless their efforts to maintain the balance of nature. May their wisdom continue to guide us all toward a deeper understanding of what it means to care for Your creation.

Lord, let our actions reflect Your love for all that You have made. Help us to be mindful of the impact we have on the earth and to live in a way that honors You. In every decision we make, may we seek to restore and protect the balance of nature, ensuring that future generations can enjoy the beauty and abundance of Your creation.

In Jesus's name, we pray. Amen.

60 **End of lesson**

13. Secondary School Lesson 2: English

Pastoralist Maasai Traditional Environmental Knowledge for Creation Care

Main Point

The Maasai traditional environmental knowledge aligns with biblical principles of creation care (where God calls us to be stewards of the Earth [review Lesson 1]).

Learning Outcomes

As a result of this lesson, the learner will:

Cognitive: Know

Bible

- **Review:** Understand that caring for creation in line with biblical principles is a sacred duty given by God.
- Know that the "biblical creation triangle" refers to the relationship between God, humanity, and non-human creation.

Maasai

- Know how Maasai traditional environmental knowledge (TEK) reflects a similar sense of duty and responsibility toward the environment as seen in biblical creation care in Lesson 1.
- Understand how the Maasai traditional worldview—illustrated by the three-legged stool—is similar to the "biblical creation triangle."

Science

- Review: Understand the core concepts of climate science (i.e., climate change, blanket/greenhouse effect, human caused global-warming gases) and their effects on ecosystems and humans.
- Review: Realize that climate science intersects with the spiritual and ethical dimensions of environmental stewardship described in biblical teachings.
- Review: Understand how climate change impacts the Maasai community's environment and traditional way of life.
- Deepen understanding of how both Maasai traditions and climate science emphasize the importance of living in harmony with the environment and protecting natural resources.
- Understand the role of grasslands as a very effective carbon sink.
- Understand that science has studied and determined best practices to protect and care for living things and their environment to help restore or maintain a balance in nature.

Hope

- Understand that despite the current challenges, the Bible teaches that God created the earth with a purpose and will bring a future restoration of creation (Revelation 21:1–4).
- Our efforts to address climate change are part of working towards this hopeful future.

Affective: Feel

- A deep sense of love, respect, and responsibility for God's creation (referenced from the ancient wisdom of Bible verses).
- Communal connection to the land through highlighted stories from the Maasai traditions.
- Inspired by Maasai traditional environmental knowledge, sustainable practices, and harmonious relationship with the land.
- Empowered to blend these traditional practices with environmental science strategies to enhance stewardship and sustainability.

Applicative: Do

- Ask learners to identify one or two traditional Maasai practices they can adopt or promote in their community to enhance environmental stewardship.
- Ask learners to reflect on how they can integrate both Maasai knowledge and biblical teachings in their daily lives to care for the environment.
- Or write a verse to a traditional Maasai tune communicating the main point.

Teaching Equipment Needed	Student Supplies/ Handouts
• Visual aids (charts, pictures) on environmental care	• Scripture references on creation care
• Bible for the teacher (preferably with relevant verses marked)	• Reflection questions for group discussion
• Flip chart or whiteboard (pens, paper)	• Exercise book or notebooks
• *Maasai seasonal calendar (enkanyit)*	• Pen or pencil and eraser
• *Grazing/land-use cycle diagram*	• Colored pencils for drawing ecosystems

See Resources Chapter 16 and 17. Italicized items are other ideas to conside yet not included in the resource.

Time	Content

8

- From the traditional Maasai perspective, it is believed that the ancestor of the Maasai was God, and *Engai* gave sticks and rope for the herds.
- **Storytelling Activity (same groups of 2 or 3 from lesson 1):**
  - Think about one of the traditional Maasai stories you know that emphasizes the importance of caring for the land. This could be a story about the relationship between the Maasai and their cattle, highlighting the balance they maintain with nature.
  - Summarize the story in 2 minutes with a conversation partner.
  - See Maasai information below and in the Resources, Chapters 16 and 17, if needed.

Transition statement (connecting Hook to Main Point)

There is a deep-rooted belief that reflects the Maasai's unique relationship with nature and their role as caretaking of the land. By understanding their traditions, we can explore how such cultural perspectives shape their interactions with the environment and inform broader lessons about sustainability and coexistence. Let's explore them now!

Maasai Traditional Environmental Knowledge

Maasai traditional environmental knowledge (TEK) is deeply tied to their relationship with nature and the land. The Maasai see themselves as **guardians or caretakers** of the earth, responsible for protecting and maintaining the balance of the environment, especially in relation to their cattle, land, and natural resources. Here are key points about Maasai caretaking:

1. **Respect for the Land:**
   The Maasai believe the land is sacred and must be treated with respect. They use the land for grazing cattle, farming, and living, but they also make sure to preserve it. This includes rotational grazing, which involves moving their herds between different pastures. This technique prevents overgrazing in any single area, allowing vegetation to recover and maintain soil health.
2. **Sustainable Grazing:**
   The Maasai are known for their careful management of cattle. They move their herds regularly to avoid overgrazing any one area, allowing the grass and plants to regrow. This ensures that the land stays healthy and can continue to support life.
3. **Water Conservation:**
   Water is very important to the Maasai, especially in the dry seasons, due to the arid and semi-arid regions they inhabit. They know where to find water sources, and they use them wisely, making sure not to waste water. They carefully manage water sources, using them sparingly and ensuring that they are not overused. This includes practices like digging shallow wells, using water pans, and protecting water catchment areas to ensure that water remains available during dry seasons.
4. **Spiritual Connection to Nature:**
   The Maasai have a strong spiritual connection to nature. They believe that the land, animals, and the sky are all gifts from God (*Engai*), and it is their responsibility to care for them. Their traditional practices, such as managing resources and not permanently selling land, reflect this belief. This includes preserving sacred natural sites. Certain natural sites and landscapes, such as specific trees, rocks, or water sources, are considered sacred by the Maasai. These sites are protected from exploitation and disturbance, preserving biodiversity and ecological balance.
5. **Passing Down Knowledge**:
   The Maasai pass down knowledge about caretaking from generation to generation. Elders teach the younger members of the community how to take care of the cattle, the land, and the environment, ensuring that future generations continue to respect and care for nature.

See more in Resources Chapter 16.

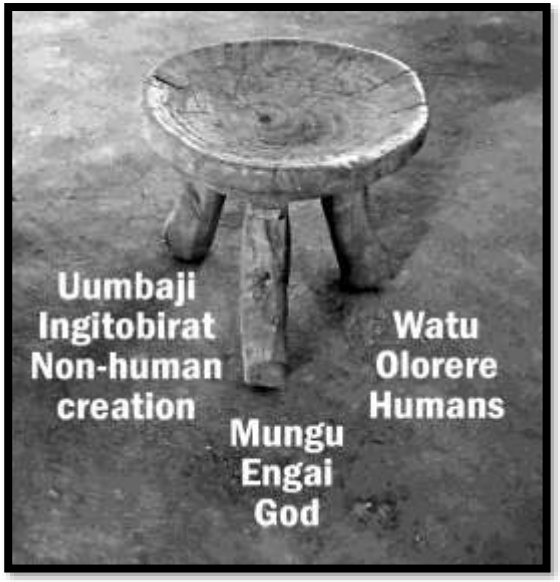
This Maasai understanding of life—or the **Maasai worldview**—can be symbolized by a **three-legged stool.**

- The Maasai understand that human flourishing (well-being) in life comes from harmonious relationships with: 1) *Engai*, 2) other people, and 3) the environment.
  - These three aspects are seen as a three-legged stool, *olorika*.
  - With three legs, it can be stable—even on uneven ground—and work well.

Biblical "Creation Triangle"

10 The Maasai worldview is similar to what is seen in the Bible, what is called the biblical "creation triangle."

- The biblical understanding is that human flourishing (*shalom*/peace/holistic well-being) in life comes from being in a right relationship with 1) God, 2) other people, and 3) non-human creation.
- Thus, there is a core understanding of God's world that is shared between Christians and Maasai.
- This shared understanding means that biblical teachings of creation care align with Maasai understandings, and Maasai traditional understandings affirm the Bible's ancient wisdom.



Bible Exploration Activity

- Break students into small groups of 2 to 3 students. Each group is assigned one Bible text: **Genesis 1:26–28, Psalm 24:1–2, Leviticus 25:1–7.**
- Ask them to read the scripture and discuss the following questions:
  - What does it say about God's ownership of the earth?
  - What responsibility does it give humans?
  - How does this apply to our lives today in terms of environmental caretaking?
- After small-group discussion, have a reporter from each group present their insights. If there is limited time, have one reporter from each Bible text share, and invite the others to add missing aspects.

3) LOOK interpretation/reflection on core content

Maasai and Biblical Creation Care

10
- **Group Discussion:** Students continue in their small groups and are provided with reflection questions:
  - How do the Maasai practices align with the concept of stewardship found in the Bible?
  - What can we learn from these practices that can be applied today?
  - How does understanding Maasai environmental knowledge deepen our understanding of God's command to care for creation?

Note: Students are given time for each group to share their insights. Notes to guide your discussion:

- **In relation to the biblical principles and Maasai practices,** both traditions reflect a deep respect for God's creation.
  - By viewing the land as sacred and managing it with care, the Maasai exemplify the stewardship role that the Bible entrusts to humanity, treating the earth not as a possession but as a divine gift to be preserved and respected.
- Rotational grazing and Sabbath year rest:
  - The Israelites were instructed to refrain from working the land during the Sabbath year.
  - The Maasai conservation efforts reflect a recognition that natural resources are finite and must be used responsibly to avoid depletion. The Maasai recognize that overgrazing can lead to land degradation, loss of vegetation, and soil erosion, which would harm the environment and reduce the land's ability to support life. By rotating grazing areas, the Maasai not only preserve the land's fertility but also ensure that it can continue to provide for future generations.
- Also, by studying these practices, we gain practical insights and a deeper understanding of how to fulfill God's command to care for God's creation in a way that honors both the environment and the Creator.

Note: In the next lesson, there will be a discussion of how Maasai TEK aligns with climate science.

Look Continued: Hope

4
- *Hope* in the Maasai context aligns with the concept of stewardship found in the Bible. The belief upholds a sustainable, harmonious future, where humans actively care for the earth and its resources.
- Both the Maasai and the Bible emphasize the responsibility of humans to care for creation, ensuring its health and sustainability for future generations. This not only ensures a balanced relationship with nature but also fulfills the biblical vision of humans living in harmony with God's creation.
- In the Maasai traditions, hope is reflected in their practices of maintaining ecological balance and sustainability, allowing the land to rest and regenerate. Similarly, the Bible expresses hope through teachings that encourage humans to care for creation as a lasting, sacred responsibility, ensuring the earth remains a place of blessing for generations to come.

4) TOOK application: what to DO/take away

Applying TEK and Biblical Creation Care

15
- Ask learners to identify one or two traditional Maasai practices they can adopt or promote in their community to enhance environmental stewardship.
- Ask learners to reflect on how they can integrate both Maasai knowledge and biblical teachings in their daily lives to care for the environment.
- Learners are asked to write down their commitment and share it with a partner or group.

Write a Verse to a Song

Or
15
- Your first verse was about God commissioning us to care for God's good creation.
- Now write the second verse of a song about traditional Maasai environmental knowledge and practices that are also best practices of climate change mitigation (reduction).
  1. Take a traditional Maasai tune and write new words based on this lesson.
  2. The content of the verses needs to connect to the lesson content.

Provide as much time as possible to work on writing a song verse. At the end of the time:

- Can we have 2 or 3 groups share their verse with us? Only volunteer if you are ready and can sing it without much delay.

At the end of the lesson, encourage the development of the song verses.

- In the next and last lesson, you will also add one more verse. So, this project will continue to develop.

Prayer

2 O *Engai*, our God of the Sky and Earth,

We come before you with humble hearts, grateful for the gifts of this land. We ask for your blessings as we tend to the land and our herds. Guide us in our grazing, so that we may rotate our pastures wisely and prevent the overuse of your precious soil. Help us manage the fires that renew the grasslands, allowing new life to flourish.

Protect the sacred places that you have blessed, and let us honor them with reverence. Grant us the wisdom to conserve our water sources and share them fairly among our people. May we continue to cherish and protect the wildlife that roams alongside us, understanding that their presence is a sign of your grace and balance.

We pledge to honor and sustain the beauty of your creation, O *Engai*, in all that we do. Amen.

60 **End of lesson**

14. Secondary School Lesson 3: English

Integrating Climate Science for a Maasai Context

Main Point

Climate change is impacting the Maasai community's traditional way of life but integrating climate science with cultural and environmental knowledge can support mitigation and adaptation for sustainable living.

Learning Outcomes

As a result of this lesson, the learner will:

Cognitive: Know

Science

- **Review:** Understand the core concepts of climate science (i.e., climate change, blanket/greenhouse effect, human caused global-warming gases or greenhouse gases, GHGs) and their effects on ecosystems and humans.
- Understand further how climate change affects biodiversity, water sources, and weather patterns.
- **Review:** Understand the main impacts of climate change upon ecosystems and humankind.
- Know the difference between climate change mitigation (prevention) and adaptation (reducing risk to the bad effects).
- Understand core principles of sustainable pastoralism.

Maasai

- **Review:** Understand how climate change affects the pastoralist Maasai traditional way of life.
- Understand how integrating science and traditional environmental knowledge (TEK) can help the Maasai with adaptation to the bad effects of climate change and support sustainable living.

Biblical Creation Triangle

- **Review:** Understand how climate science can support creation care with its spiritual and ethical dimensions of environmental stewardship described in biblical teachings.

Hope

- Understand that climate scientists and environmentalists have hope that human efforts can mitigate climate change, which encourages hope.
- Know key Bible texts that teach that God has promised to never abandon creation and that God will bring its ultimate reconciliation and restoration.

	• Realize that our efforts to address climate change are part of working towards God's hopeful future while being faithful to God's commission to care for creation.
Affective: Feel 	• **Appreciation** for Maasai traditional environmental knowledge (TEK). • **Responsibility** toward preserving the environment for future generations. • **Hopeful** for the future with human efforts and God's promises.
Behavioral: Do 	• Have students brainstorm practical actions that the Maasai community could take to adapt to climate change, such as water conservation methods, sustainable grazing practices, or diversifying their livelihoods.

Teaching Equipment Needed	Student Supplies/ Handouts
• Whiteboard and markers • The Blanket Effect (The Greenhouse Effect) diagram (back cover) • *Flooded or eroded landscape* • *Animations of rainfall change, rise or desertification* • *Cattle models or pictures*	• Pens, pencils and eraser • *Food Chain/Food Web Worksheet* • *Grazing Field Observation Sheet* • *Weather Monitoring Logbook* • *Livestock Nutrition and Health Handout*

See Resources Chapter 17. Italicized items are other ideas to conside yet not included in the resource.

Time	Content

5 "Have you ever wondered what would happen if the Earth's temperature kept rising, or if our weather started changing in ways we couldn't predict? Imagine floods, droughts, and stronger storms becoming more frequent—how would our world look then? What if this was already happening, and it's up to us to help stop it?"

Notes to teachers: *By starting with a* ***question*** *about climate change, it invites students to consider the reality of the issue. This is followed by vivid* ***imagery*** *of what could happen as a result of climate change. The key is to create an emotional connection and intrigue, prompting curiosity about the topic.*

Helpful information for teachers: *When the rains come, the Maasai move their herds to new pastures, allowing the land to recover and grow fresh grass. This rotational grazing ensures that the land remains fertile and productive. The Maasai have inherited this practice from their ancestors. They understood that balance and respect for the land were key to their survival.*

- In the dry season, when the earth cracks under the relentless sun, the Maasai must travel long distances to find water sources for their herds. The Maasai know where to find hidden springs and seasonal rivers, passed down through generations of knowledge. Water is not just a resource; it is a lifeline, a critical element that shapes their movements and daily routines.
- The Maasai community, known for their rich cultural heritage and traditional pastoralist lifestyle, has long depended on the natural environment for their livelihood. However, in recent years, the effects of climate change such as unpredictable rainfall, prolonged droughts, and diminishing grazing lands have posed significant challenges to their way of life. Therefore, integrating climate science into the Maasai context is crucial for understanding these changes and developing strategies to adapt and thrive in a changing environment.
- By blending modern climate science with Maasai traditional ecological knowledge, we can create a holistic approach that respects cultural practices while promoting sustainable solutions. This integration not only empowers the Maasai to protect their environment and sustain their livelihoods but also enriches their understanding of the world around them, fostering resilience in the face of climate challenges.

Transition statement (connecting Hook to Main Point)

1
- But what happens when that environment begins to change in ways we don't expect?
- Let's explore how climate science can help us understand these changes and find ways to protect the Maasai way of life.

Review *with the students the basic climate science concepts introduced in Lesson 1, including the definition of climate change/global warming, the meaning of greenhouse effect, and common GHGs. Use examples that are relatable to the Maasai context, such as changes in rainfall patterns, drought, and the availability of grazing land.*

Climate Change and Global Warming

12 Let's review our core climate science concepts.

- Who can give me a definition of **climate change?**
  - Climate change refers to **long-term changes** in temperature, precipitation, wind patterns, and other aspects of the Earth's climate system.
  - It includes both natural processes and human activities that alter the Earth's climate over extended periods.
  - This is a natural process that keeps the Earth warm enough for life. However, climate change is **primarily driven by human activity:**
    - Like cutting down trees (reducing the taking up of CO_2), mining, bad methods of farming including the excess use of chemical fertilizer,
    - And burning fossil fuels (petrol, oil, coal) which release extra global-warming gases into the air.
  - This causes the Earth to trap too much heat, leading to **global warming** and **climate change**, called the **"blanket effect"** or **"greenhouse effect."**

- Now a new concept: Climate change is different than global warming.
  - **Global warming** is a major factor contributing to the broader phenomenon of **climate change**, but climate change also includes non-temperature related changes, such as shifting rainfall patterns, ocean acidification, and more.
  - **Global warming** refers to the increase in the Earth's average surface temperature due to human activities, particularly the emission of global warming gases or greenhouse gases.

- Who can give me a definition of **the blanket effect (or greenhouse effect)?**
  - The **blanket effect** (or **greenhouse effect)** is when the Earth's surface warms up.
  - It occurs when certain gases in the Earth's atmosphere, known as global-warming gases (or greenhouse gases, GHGs), trap heat from the sun.
  - The gases let sunlight in but prevent some of the Earth's heat from escaping back into space, thus keeping the planet warmer than it would be otherwise.

- Who can tell me some of the **global warming gases** (or **greenhouse gases)?**
  - These gases include carbon dioxide (CO_2), methane (CH_4), and water vapor (H_2O).
  - Lesser known and less important for this less:
    - Nitrous Oxide (N_2O): Is emitted from agricultural activities, especially the use of synthetic fertilizers, and from fossil fuel combustion.
    - Fluorinated Gases: These synthetic gases, used in industry and refrigeration, have a high global warming potential but are present in smaller quantities.

- What is the difference between mitigation and adaptation?[4]
  - **Mitigation** measures are those actions that are taken to reduce global-warming gas emissions.
  - **Adaptation** measures are based on decreasing vulnerability to the effects of climate change.
  - Thus, Mitigation seeks to **reduce** the *causes* of climate change,
    while adaptation seeks to make people more **resilient** or **less vulnerable (less at risk)** to the *impacts* of climate change.

- Who can tell me some of the **effects of climate change?**
  - **Increased temperatures**: Human activities like burning fossil fuels release CO_2 and other global-warmning gases into the atmosphere, trapping heat and causing global temperatures to rise. This disrupts natural climate patterns and leads to more frequent and severe weather events.
  - **Changing rainfall patterns:** With climate change, rains have become more erratic, leading to droughts or floods.
  - **Extreme weather events**, like floods or droughts can damage the environment, further upsetting the natural balance.
  - **Resource depletion:** Increased temperatures and prolonged droughts leads not only directly to diminished water for grazing lands, but also contributes to further degradation by overgrazing.
  - **Ecosystem disruption**: Higher temperatures and altered precipitation patterns affect ecosystems, leading to habitat loss, species migration, and changes in food chains. These disruptions harm biodiversity and the balance of natural systems.
  - **Loss of biodiversity:** As the climate shifts, some species that are not able to survive in warmer or disrupted ecosystems.

- **Ocean changes**: Warming temperatures and increased CO_2 levels result in ocean warming and acidification, which damage marine ecosystems, including coral reefs.
- **Melting** ice **and rising seas**: The warming climate causes glaciers and ice caps to melt, contributing to rising sea levels. This disrupts coastal ecosystems and threatens human and wildlife communities.

- **Here's some new information:** The scientists say that **climate change will affect humans** in many ways, including:
  - **Famine and food insecurity**, due to droughts and flooding that ruins crops
  - **Freshwater shortages**
  - **Health problems**
    - **More malaria** and other climate-sensitive diseases
    - **Poor air quality** causes respiratory diseases
  - **Heat waves** that are longer and hotter than normal which causes
    - **Heat related health problems**, especially for pregnant and older women
    - **Death** for vulnerable people, especially the sick and elderly
  - **Destruction of homes**, due to flooding and extreme weather
  - **Migration or "climate change refugees"** due to migration caused by lack of water, crop failure, extreme weather, etc.

Effects of Climate Change on the Maasai

7 - Now, let's talk about these effects of climate change and how they affect the pastoralist Maasai.
- Of the things we just mentioned, who can tell me one way how the Maasai will be affected? I want to hear from many of you with one concept each.
  - **Increased temperatures:** This disrupts natural climate patterns and leads to more frequent and severe weather events, including droughts that reduce grazing areas.
  - **Extreme weather events**, like floods or droughts can damage the environment, further upsetting availability of the natural resources upon which pastoralist livelihoods are dependent.
  - **Changing rainfall patterns:** The Maasai rely on predictable seasonal rains for grazing their livestock.
    - Disruption of the availability of pasture and water directly threatens the survival of their herds, which are central to Maasai culture and economy.
    - To cope with reduced grazing areas and water sources, the Maasai may have to move their herds more frequently or over longer distances.
  - **Resource depletion:** Increased temperatures and prolonged droughts contribute to the degradation of grazing lands by overgrazing, driven by the need that the Maasai people have to find adequate pasture.
  - **Loss of biodiversity:** As the climate shifts, some species that are vital to the Maasai ecosystem may become endangered or extinct. This loss of biodiversity disrupts the delicate balance of nature that the Maasai have long maintained, affecting everything from grazing patterns to the availability of medicinal plants.

- **Ecosystem disruption:** Higher temperatures and altered precipitation patterns affect ecosystems, leading to habitat loss, species migration, and changes in food chains.
- **Various effects on humans:** famine, water shortages, more malaria, other diseases will increase, etc., and, thereby, the need to sell livestock for medical treatments.

Integrating Climate Science and Maasai Traditional Environmental Knowledge (TEK)

Maasai Adaptations

7

- Due to climatic changes, the pastoralists are integrating climate science and developing the following:
  - **Sustainable pastoralism:** Maasai may have to move their herds more frequently or over longer distances. They are adapting by incorporating modern weather forecasts with traditional knowledge to better plan grazing and water use.
  - **Drought-Resistant Grazing Systems:** Developing grazing systems that are resilient against drought can help manage limited resources more effectively.
  - **Water Conservation Efforts and Efficient Water Use:** The Maasai are exploring new methods for conserving water, such as rainwater harvesting and improving traditional well construction to secure a more reliable water supply during dry periods. Improving water storage and usage practices, such as building more efficient wells and using water-saving technologies, supports the stewardship of water resources.
  - **Greener Energy:** In an effort to reduce burning wood, which releases the global-warming gases, CO_2, some Maasai are using:
    - Solar panels
    - Fuel efficient stoves, which:
      - Reduces the burning of firewood by 60% (less work to collect and haul wood) and
      - Reduces the smoke in the home by 90% (less respiratory diseases) and
      - Reduces the number of children burned by cooking fires.

See Resources, Chapter 17.

  - **Diversified Livelihoods:** In response to changing conditions, the Maasai are looking at diversifying their sources of income and food, including integrating new agricultural practices, such as eco-farming, or supplementary income sources to reduce their reliance on traditional pastoralism alone.
  - **Educating the Maasai community** about climate science and its implications fosters a deeper understanding of their role as caretakers of the land. This education helps them make informed decisions that honor their stewardship responsibilities while adapting to environmental changes.

- **Creation Care/Stewardship:** The Maasai—especially youth—are developing their understanding that being a steward of God's creation means integrating their science teachings that encourages actively participating in environmental conservation efforts, such as volunteering for clean-up projects, participating in tree-planting initiatives, or joining environmental projects.

Alignment with Biblical Creation Care

3

- **Review:** Reflect on how being a caretaker of the earth is emphasized in the Bible, e.g., **Genesis 2:15**, where God places Adam in the Garden of Eden to work and serve it (take care of it). The biblical mandate to work, serve, and take care of it reflects a call to active and responsible stewardship.
- Discuss how the Maasai can apply these principles to protect their environment align with biblical creation care. For the Maasai, this means continuing their traditional practices while embracing new knowledge and technologies that support environmental sustainability.

Look Continued: Hope

Hope in Climate Science

8

- Climate scientists emphasize the interconnectedness of humans and nature and highlight the urgent need for action to protect the planet. The message from climate science parallels the biblical call for creation care, underscoring the role of humanity in maintaining environmental health and ensuring sustainability.
- From the perspective of climate scientists, there is hope that if we change our behaviors—through sustainable practices, green technologies, and conservation efforts—we can reverse or mitigate some of the damage done to the planet. Hope lies in our collective ability to care for the environment in a way that ensures future generations can enjoy a thriving, healthy world.
- **Wangarī Maathai,** a Nobel laureate and Kenyan environmentalist, wrote in *The Challenge for Africa*: "Indigenous knowledge and traditions can teach us valuable lessons in environmental stewardship and how to live in harmony with the land, honoring both creation and the Creator."

Biblical Hope

- Through scripture, we are reminded that God has promised to never abandon creation and will result in its ultimate reconciliation and restoration.
  - **The God of hope will never abandon the creation.**
    - Know that God is the Creator and Sustainer of the world, who will never abandon God's creation but will reconcile all things to Jesus Christ. **Colossians 1:15–20**
    - Know that "hope" in the Bible is not wishful thinking, but the hopeful expectation that what God has promised will be fulfilled (and promised glory revealed). **Romans 8:19–25**

  - **Resilience of God's creation**
    - Realize that there is amazing resilience in God's creation. Despite huge and ongoing effects of human-caused climate change, we are called to faithfully continue the creation care mandate of **Genesis 2:15** to nurture the restoration.

- Know that **creation care works,** we need more of it. So that many people working together in little ways can make a big change.
- Realize that our efforts to address climate change are part of **working towards God's hopeful future** while being faithful to God's commission to care for creation.

- **The cosmic power of the Holy Spirit for transformation and re-creation**
  - Understand that **the greatest challenge** is not lack of science, technology, or resources, but **rather greed and apathy**—and these need a spiritual transformation by the power of the Holy Spirit.
  - Know that the power that raised Christ from the dead is available to us who believe. **Ephesians 1:19–20**
  - Know that God will restore creation when Jesus Christ returns. **Romans 8:21**; **Revelation 21:1–5**

Encouragement

- **Dr. Katharine Hayhoe**, a climate scientist, explains: "Caring for the earth is an expression of our love for God and for our neighbors, and should be an essential part of the Christian mission in the world."
- Just as the Bible calls us to love our neighbors and care for God's creation, climate science shows that taking responsibility for environmental health is essential to ensuring the well-being of current and future generations

Activity

15

- Have students brainstorm practical actions that the Maasai community could take to adapt to climate change, such as water conservation methods, sustainable grazing practices, or diversifying their livelihoods.
- For the Maasai community, adapting to climate change involves implementing practical actions that align with their traditional practices while integrating modern techniques to ensure sustainability.
- Here are some practical actions that the Maasai could take:
  - **Install rainwater harvesting systems:** Collect and store rainwater from rooftops and other surfaces using tanks or cisterns. This water can be used during dry periods for drinking and irrigation.
  - **Create pans and dams:** Build small dams or water pans to capture and store runoff water from rain. These structures can help replenish groundwater and provide water during dry seasons.
  - **Efficient water use:**
    - **Improve construction of wells:** Reinforce traditional wells with modern materials to reduce evaporation and contamination. Ensure proper maintenance to maximize their lifespan.
    - **Drip irrigation:** Use drip irrigation systems for any agricultural activities, which delivers water directly to the plant roots, reducing water wastage.

  - **Water-saving techniques:**
    - **Promote water-use efficiency:** Educate the community on water-saving practices, such as fixing leaks, using water-efficient fixtures, and minimizing water use where possible.
  - **Enhance rotational grazing:** Refine traditional rotational grazing methods to ensure that pastures are given adequate time to recover. Implement systems that rotate grazing areas more frequently based on vegetation health and soil condition.
    - Reseed and restore degraded lands: Plant drought-resistant grass species and restore degraded pastures to improve their productivity and resilience.
    - Monitor and manage overgrazing: Use scientific methods to monitor the condition of grazing lands and manage herd sizes to prevent overgrazing and land degradation.
    - Grow and store fodder: Cultivate drought-resistant fodder crops and store them for use during dry periods. This ensures that cattle have adequate nutrition even when pasture is scarce.
  - **Develop eco-tourism:** Promote eco-tourism initiatives that leverage the Maasai's rich cultural heritage and natural landscapes, providing an alternative source of income while conserving the environment.
  - **Craft and artisanal products:** Encourage the production and sale of traditional Maasai crafts and artisanal products, which can serve as a source of income and preserve cultural heritage.
  - **Agroforestry:** Integrate trees and shrubs into agricultural systems to improve soil fertility, reduce erosion, and provide additional sources of income.
- Encourage students to think of ways they can contribute to environmental conservation in their own lives.

Write a Verse to a Song

Or
15

- Get in the same groups from the first lesson, continue writing your song to the same traditional Maasai tune. You have 10 minutes to work together.
- Your first verse was about God commissioning us to care for God's good creation. The second verse was about traditional Maasai environmental knowledge and practices that are also best practices of climate change mitigation (reduction).
- Now, write the third verse of a song about best practices of climate change mitigation (reduction) and/or adaptation (resilience) that is: 1) informed by climate science and 2) appropriate for a traditional Maasai context.
- You can also write a verse about how **we can find something we are passionate about and work with friends, so that together we can make a difference.** And we can find hope knowing that many other small groups around the world are joining with us to make a difference in caring for God's creation. This option could be a fourth verse!
- Remember, the guidelines are:
  - Take a traditional Maasai tune and write new words based on this lesson.
  - The content of the verses needs to connect to the lesson content.
  - You can also write a verse—or fourth verse—about how everyone working together can make a big difference.

After 10 minutes:

- Can we have 1 or 2 groups share their verse with us? Only volunteer if you are ready and can sing it without delay.
- I encourage you to work on developing your song.

Ending: Remember, everyone working together can make a big difference!

Prayer

2 Heavenly Creator,

We come before you with hearts full of gratitude for the gift of creation and the beauty of the land we call home. We acknowledge your role as the Creator and Sustainer of all things.

Lord, we seek your wisdom as we face the challenges brought by climate change. We ask for guidance in understanding the signs of our changing environment and for the knowledge to integrate science with our traditional practices. Help us to adapt with grace and to use the knowledge you have provided to us to care for our land and water.

Grant us the strength and courage to implement sustainable practices, such as conserving water, managing our grazing lands wisely, and diversifying our livelihoods. May our efforts honor your creation and reflect our commitment to being good stewards of the resources you have entrusted to us.

Bless our community with unity and cooperation as we work together to protect our environment and preserve our way of life for future generations. Let us be inspired to embrace both our cultural heritage and the insights from climate science to achieve a harmonious balance.

In your name, we pray for wisdom, strength, and protection. Amen.

60 **End of lesson**

Bibliography

[1] "Climate Change Mitigation and Adaptation: Simple Guide to Schools in Africa," with Ann Therese Ndong-Jatta, UNESCO, United Nations Educational, Scientific and Cultural Organization, 2019, 4, https://unesdoc.unesco.org/ark:/48223/pf0000372168.
[2] "Climate Change Mitigation and Adaptation," 4.
[3] "Climate Change Mitigation and Adaptation," 8–12.
[4] "Climate Change Mitigation and Adaptation," 13.

Part 3:
Resources for the Lessons

15. Resources for Lesson 1:

Biblical Creation Care

Resources Below

1. More Creation Care Related Bible Verses
2. If more time, here are more teaching suggestions
3. Creation Care Resources and Quotes from African Scholars
4. Creation Care Resource Books and Quotes

1. More Creation Care Related Bible Verses

These are more Bible verses (beyond what has been discussed in the lessons) that reveal:

- We have been given a mandate to look after what God has made.
- We are called to care for our fellow humans.
- Jesus died for all creation—not just humans.
- All creation has suffered due to bad human actions.
- God will restore creation when Jesus returns.

- **Genesis 1:25-28** "God made the wild animals according to their kinds, the livestock according to their kinds, and all the creatures that move along the ground according to their kinds. And God saw that it was good. Then God said, 'Let us make man in our image, in our likeness, and let them rule over the fish of the sea and the birds of the air, over the livestock, over all the earth, and over all the creatures that move along the ground.' So God created man in his own image, in the image of God he created him; male and female he created them. God blessed them and said to them, 'Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish of the sea and the birds of the air and over every living creature that moves on the ground.'"
- **Genesis 4:9–10** Then the LORD said to Cain, "Where is your brother Abel?" / "I don't know," he replied. "Am I my brother's keeper?" / The LORD said, "What have you done? Listen! Your brother's blood cries out to me from the ground.
  - We are commissioned to care for others, which includes caring for the environment which others are dependent upon for their livelihoods.
- **Leviticus 25:1–7** The LORD spoke to Moses on Mount Sinai, saying, "Speak to the people of Israel and say to them, When you come into the land that I give you, the land shall keep a Sabbath to the LORD. For six years you shall sow your field, and for six years you shall prune your vineyard and gather in its fruits, but in the seventh year there shall be a Sabbath of solemn rest for the land, a Sabbath to the LORD. You shall not sow your field or prune your vineyard. You shall not reap what grows of itself in your harvest, or gather the grapes of your undressed vine. It shall be a year of solemn rest for the land. The Sabbath of the land1 shall provide food for you, for yourself and for your male and female slaves and for your hired worker and the sojourner who lives with you, and for your cattle and for the wild animals that are in your land: all its yield shall be for food.
  - The land itself must be given a rest and not abused.

- **Leviticus 25:23-24** "The land must not be sold permanently, because the land is mine and you are but aliens and my tenants. Throughout the country that you hold as a possession, you must provide for the redemption of the land."
- **Deuteronomy 10:14** "Behold, to the LORD your God belong heaven and the heaven of heavens, the earth with all that is in it.
  - All of heaven and earth belong to the LORD."
- **Psalm 8:3-8** "When I consider your heavens, the work of your fingers, / the moon and the stars, which you have set in place, what is man that you are mindful of him, the son of man that you care for him? /You made him a little lower than the heavenly beings and crowned him with glory and honor. / You made him ruler over the works of your hands; you put everything under his feet: /all flocks and herds, and the beasts of the field, / the birds of the air, and the fish if the sea, all that swim in the paths of the seas."
- **Psalm 104:14–24**

  You cause the grass to grow for the livestock
  and plants for man to cultivate,
  that he may bring forth food from the earth
  and wine to gladden the heart of man,
  oil to make his face shine
  and bread to strengthen man's heart.
  The trees of the LORD are watered abundantly,
  the cedars of Lebanon that he planted.
  In them the birds build their nests;
  the stork has her home in the fir trees.
  The high mountains are for the wild goats;
  the rocks are a refuge for the rock badgers.
  He made the moon to mark the sseasons;
  the sun knows its time for setting.
  You make darkness, and it is night,
  when all the beasts of the forest creep about.
  The young lions roar for their prey,
  seeking their food from God.
  When the sun rises, they steal away
  and lie down in their dens.
  Man goes out to his work
  and to his labor until the evening.
  O LORD, how manifold are your works!
  In wisdom have you made them all;
  the earth is full of your creatures.
  - This selection of Psalm 104 is a beautiful creation psalm. The psalmist praises God for both creating and caring for the many, many different created beings in our world.
- **Matthew 6:26–27** "Look at the birds of the air: they neither sow nor reap nor gather into barns, and yet your heavenly Father feeds them. Are you not of more value than they? And which of you by being anxious can add a single hour to his span of life?"
  - God cares for the birds and all of God's creation.
  - God's care for us gives us hope in spite of challenges.
- **Romans 8:22-23** "We know that the whole creation has been groaning as in the pains of childbirth right up to the present time. Not only so, but we ourselves groan inwardly as we wait eagerly for our adoption as sons, the redemption of our bodies."
- **1 Corinthians 10:26** For "the earth is the Lord's, and the fullness thereof." (Quote from Psalm 24:1)
  - Creation and all created things are inherently good because they are of the Lord.
- **Colossians 1:19-20** "For God was pleased to have all his fullness dwell in him [Christ] and through him to reconcile to himself all things, whether things on earth or things in heaven, by making peace through his blood shed on the cross."

2. If more time, here are more teaching suggestions:

Invite students to reflect on their position in God's creation.

- Think of how you feel when the creation provides you with all you need. (Blessed by God's good creation)
- Think of the position humans holds, being entrusted by God. Mention the tasks of Maa elders, leaders, warriors, men, women and parents and children concerning creation care. Think of God's purpose in placing you in that position in his creation. (Honored to be commissioned by God to care for creation)
- Think of your sincere response to God for such a blessing. (Committed to care for God's creation)

3. Creation Care Resources and Quotes from African Scholars

Here are some quotes from African men and women scholars and others on biblical creation care. They can be applied for Maasailand. They are organized into **creation care principles**, **gender and stewardship**, and **cultural perspectives**.

1. Creation Care Principles

- **Kirsteen Kim** (2015, African theologian): "In Africa, caring for creation is about respecting God's gift of nature, not just protecting it."
  - This quote emphasizes that **caring for creation** is not just about environmental protection, but about **honoring and respecting** the earth as a divine gift.
- **J. Kameri-Mbote** (2000, Kenyan scholar): "African cultures, like the Maasai, believe creation should be respected, which aligns with the Bible's call to care for the earth."
  - This highlights the **biblical call to respect and care** for creation, which is also deeply rooted in **African cultural values**, such as those in Maasai culture.

2. Gender and Stewardship

- **Nyambura J. Njoroge** (2009, Kenyan theologian): In Africa, women, like Maasai women, are key to protecting nature, reflecting the biblical call to nurture the earth."
  - Njoroge points out how **women**, especially Maasai women, play a critical role in **protecting the environment**, which is aligned with the **biblical responsibility** to nurture creation.
- **Grace Ji-Sun Kim** (2012, Ecofeminist theologian): "Women's care for the earth reflects God's love, and their role in nature is part of biblical stewardship."
  - Kim connects **eco-feminism** with **biblical stewardship**, recognizing **women's role in creation care** as an expression of God's love and care for the world.

3. Cultural Perspectives on Creation Care

- **Vusimuzi Madonsela** (2014, South African theologian): "God created the earth to be cared for by all people. In Maasailand, men and women share responsibility for creation care."
  - This quote acknowledges the **shared responsibility** of **men and women** in Maasailand for **creation care**, showing the **cultural practice of stewardship** in line with **biblical principles**.

4. Creation Care Resource Books and Quotes

The following are quotes on: **Core Principles of Creation Care**, **Environmental Stewardship as a Christian Duty**, and **Practical Implications and Theological Reflections**.

1. Core Principles of Creation Care

- **Moo, Douglas J., and Moo, Jonathan A.** (2018): "Creation care is not an optional add-on to the Christian life but is integral to the biblical mandate for humanity to steward the earth as God's vice-regents."
  - This emphasizes that **creation care** is a fundamental **biblical mandate**, central to the Christian faith.
- **Middleton, J. Richard** (2004): "The gospel encompasses not just the salvation of humanity but also the redemption of creation, making environmental stewardship an essential aspect of Christian witness."
  - This highlights that **stewardship of creation** is tied to **salvation**, showing the **holistic** scope of the gospel.

2. Environmental caretaking as a Christian Duty

- **Bouma-Prediger, Steven** (2001): "The biblical vision of creation care calls Christians to a holistic approach where environmental stewardship is seen as a form of worship and obedience to God."
  - **Environmental stewardship** is viewed as a **spiritual act**, a way to **worship and obey God**.
- **McCormick, Michael R.** (2009): "Understanding creation care from a Christian perspective involves recognizing that the natural world is a sacred trust from God, requiring us to manage it responsibly."
  - **Creation care** is described as a **sacred responsibility** entrusted to humanity by God.
- **Stamps, Dennis L.** (2018): "Biblical stewardship is grounded in the understanding that God entrusts humanity with the responsibility to nurture and protect the environment as part of our divine mandate."
  - This quote stresses that **biblical stewardship** is about **nurturing** and **protecting** the earth as part of God's command.
- **Wirzba, Norman** (2013): "Biblical foundations for environmental ethics reveal that caring for the earth is not merely a practical concern but a spiritual duty reflecting our relationship with God as the Creator."
  - **Caring for the earth** is framed as a **spiritual duty** that reflects humanity's relationship with God as **Creator**.

3. Practical Implications and Theological Reflections

- **Robinson, Timothy S.** (2020): "Christians are called to be proactive in addressing environmental issues because caring for the earth is a reflection of our commitment to God's creation and His commands."
  - Christians are encouraged to be **active participants** in **environmental solutions**, demonstrating their **commitment to God's creation**.
- **Wright, Christopher J. H.** (2020): "The church must embrace creation care as a central element of its mission, integrating environmental stewardship into its theology and practice."
  - The church is called to make **creation care** a key part of its **mission**, incorporating it into both **theology and practice**.
- **Bauckham, Richard** (2022): "Creation care is deeply embedded in biblical theology, reflecting God's concern for the entire created order and our role in maintaining its integrity."
  - **Creation care** is deeply connected to **biblical theology**, emphasizing God's **concern** for all of creation and humanity's role in **maintaining its integrity**.
- **White, Lynn Jr.** (2012): "A biblical vision for environmental responsibility challenges Christians to reassess their relationship with nature and embrace a more ecologically aware lifestyle."
  - A call to **reassess relationships with nature**, encouraging a **more ecologically conscious lifestyle** as part of **biblical responsibility**.

16. Resources for Lesson 2:

Maasai Traditional Environmental Knowledge

Resources Below

1. Information about the Maasai
2. Maasai Traditional Environmental Knowledge (TEK) are Good Ways to Take Care of Creation.
3. If more time, here are more teaching suggestions
4. Scientific Analysis of Maasai Traditional Environmental Knowledge (TEK)
5. Quotes from Resource Articles and Books
6. Sustainable Pastoralism

1. Information about the Maasai

- **The Maasai, a semi-nomadic pastoralist** community in East Africa, have developed a range of environmental practices that contribute to ecological balance and sustainability. The Maasai live in harmony with nature, caring for their cattle as a gift from the land.
  - In recent decades, the Maasai have faced significant challenges, including land pressure due to population growth, changes in land tenure systems, and climate change.
  - These challenges have sometimes strained their traditional practices.
- **Maasai traditional environmental knowledge (TEK):** The Maasai continue to adapt, blending their traditional knowledge with new strategies to sustain their way of life and care for the environment.
  - The Maasai traditional environmental knowledge (TEK) is a testament to their deep understanding of and respect for the natural world.
  - Rotational grazing, water conservation, and communal land management enable the Maasai to live sustainably in challenging environments.
  - As modern challenges arise, the Maasai continue to adapt their traditional practices, ensuring that their cultural heritage of environmental caretaker remains vital in the care of creation in Tanzania.
- **Community-Based Wildlife Conservation:** The Maasai have developed various community-based conservation initiatives that integrate wildlife protection with pastoralist practices. For instance, they participate in wildlife management programs and support conservation areas, recognizing the benefits of preserving wildlife for maintaining ecological health and promoting tourism.

2. Maasai Traditional Environmental Knowledge (TEK) are Good Ways to Take Care of Creation.

1. Traditional land use plan, e.g., zoning per season
2. Management of scarce resources
3. Shared use of nature and natural resources
4. Preserving trees for domestic and medicinal purposes
5. Prohibition of killing wild animals for cultural reason
6. Keeping domestic animals for food and worship purposes
7. Traditional rules, regulations, and taboos for environmental conservation
8. The responsibility of community leadership in environmental care

3. If more time, here are more teaching suggestions

- **Organize a debate** on topics like "The Role of Culture in Environmental Conservation."
  - Use the Maasai example to highlight the value of cultural knowledge.
  - Pose a real-world problem, such as managing overgrazing or conserving water.
  - Challenge students to propose solutions using Maasai-inspired principles of caretaking and coexistence with nature.
- **Create a "Creation Care" Action Plan:**
  - **Activity**: After discussing Bible texts, have students create an "action plan" for how they, their school, or community can better care for the earth.
  - **Task**: The plan should be based on the biblical idea of stewardship, where they apply the principles of caring for the earth with reverence and responsibility.
  - **Outcome**: This encourages students to think practically about how they can implement biblical teachings in their daily lives.
- **Parent Engagement:** Have the students ask their parents three key questions:
  - What are the best ways to mitigate climate change?
  - What are the causes of climate change?
  - What are the best ways to reduce climate change?
- **Traditional practices:** Divide students into groups to discuss one of these traditional practices. Each group will explain the practice's environmental benefits and how it reflects the principle of mutual dependence.
  - **Mutual Dependence:** Maasai life is centered around the interdependence of people and the environment.
  - **Pastoral Practices:** Traditional sustainable grazing methods that ensure ecosystems are preserved.
  - **Sacred Natural Sites:** Reverence for certain trees, rivers, and mountains that are vital to Maasai spirituality and physical well-being.
  - **Water Management:** Techniques for efficient use and conservation of water resources.
  - **Fire Management:** Controlled burning to prevent larger wildfires and encourage the regeneration of vital plant species for grazing.

4. Scientific Analysis of Maasai Traditional Environmental Knowledge (TEK)

Compiled by Beth Elness-Hanson

- **Sustainable pastoralism** (semi-nomadic pasturing of cattle)
  - "…pastoralism was…a highly productive system of land use that was more compatible with wildlife conservation than other rural production systems."[1]
  - "Once vilified as a destructive land use, since the late 1980s pastoralism has come to be understood as the livelihood system most compatible with wildlife. Unlike agriculturalists, who directly compete with wildlife habitat for productive land, pastoralists typically manage their rangelands in ways that support both wildlife and livestock."[2]
  - "Pastoralism is the dominant livestock production system in most of Africa. Pastoral practices are based on local endogenous knowledge of both the environment and the animal. It is based on the continued capacity to adapt to a harsh environment, characterized by the scarcity, dispersion and variability of natural resources over vast territories."[3]
  - Making strategic and sustainable use of land areas where, "Farming in the arid and semi-arid zones is socially unacceptable (low food security because of crop failure risks) and economically not feasible."[4] Arid lands "…are unsuitable for rainfed agriculture (the driest spot [in Monduli District] is Mfereji village in the rift valley with about 200 mm rainfall annually). Soils are generally shallow and not fertile."[5]
- **Protecting biodiversity**[6]
  - Not hunting wild animals or poaching, because they are not used as food sources.
  - Even lion hunting, a former prestigious act for a warrior, is no longer supported.
- **Protecting ecosystems**
  - "Manzano and others pointed to a growing body of scholarly research demonstrating what the Maasai had long known: that their management of the land did not degrade the Serengeti ecosystem but had actually helped sustain and even create it—the grasslands the Maasai had cultivated for hundreds of years were the same grasslands that many wild animals needed to thrive."[7]
  - Not cutting down wood, in general, no logging industry; no mangrove destruction. Rather scrounging for deadwood for fires.
  - Not burning for slash and burn agriculture. Perhaps limited burns for pest management.
  - Not making charcoal.
- **Preserving grasslands, which are "carbon sinks"** (meaning they have the ability to store large amounts of carbon). (Grasslands are also an ecosystem, but it has a special focus here in a Maasai context.)
  - Allowing grasslands to rest during the dry season by moving to high groungs (*osupuko*) and returning from high grounds (*osupuko*) to go to low grounds [*olpurkel*] when the rains return, which is a good way of managing grass, trees, and flowers (flora).
  - "Grasslands store approximately 34% of the global terrestrial stock of carbon according to the World Resources Institute. Unlike forests where vegetation is the primary source of carbon storage, most of the grassland carbon is stored in the soil."[8]
  - "Increased drought and wildfire risk make grasslands more reliable carbon sinks than trees…Trees are still critical. The study does not suggest that grasslands should replace forests on the landscape or diminish the many other benefits of trees."[9]
- **Environmentally sustainable livelihoods**
  - Pastoralist Maasai are not engaged in heavy industries that produce global-warming gases, such as agro-business, manufacturing, mining, and the like. However, cows do produce some methane, CH_4.

- Pastoralist Maasai do not use artificial fertilizers that causes water pollution through phosphate and nitrate runoff.
- Pastoralist Maasai do not use herbicides and pesticides that are applied in industrial agro-business.
- Pastoralist Maasai do not practice blast fishing.
- Pastoralist Maasai do not engage in mining industries which often result in arsenic, lead, and other contaminats in the groundwater.
- Pastoralist Maasai do not engage in shipping that produces black carbon pollution, hydrocarbon oil spills from shipping refuse at the ports, as well as disposing excess nutrients from wastewater into the oceans.
- Pastoralist Maasai do not significantly contribute to the environmental challenges of urban cities.

Bibliography:

[1] Benjamin Gardner, *Selling the Serengeti: The Cultural Politics of Safari Tourism* (Athens, London: University of Georgia Press, 2016), 6. Footnote Ellis and Swift 1998; Coppock, Ellis, and Swift 1986; Warren 1995.

[2] Gardner, 24.

[3] Gaafar Rizgallah. "AU Guidelines to secure Pastorlarism [sec] and prevent conflict in Africa". African Union, 26 Sept 2022. https://au.int/en/pressreleases/20220926/au-guidelines-secure-pastorlarism-and-prevent-conflict-africa

[4] J. Douwe Meindertsma and Jan J. Kessler, eds., Meindertsma, J. Douwe, and Jan J. Kessler, eds. *Planning for a Better Environment in Monduli District*. (Netherlands Economic Institute, 1997) 46.

[5] Meindertsma, 10–11.

[6] Philip Isdor Mpango, ed., "National Environmental Master Plan for Strategic Interventions (2022 – 2032)" (United Republic of Tanzania Vice President's Office, June 2022), 61, https://www.vpo.go.tz/uploads/files/MASTER%20PLAN-English_eBOOK_FINAL.pdf. Now this chart from page 62, representing left to right, 1975, 1995, and 2015. After the Serengeti, which has the strictest prohibitions of no hunting or human activity, then the most "high" and "medium" biodiversity quality habitat is in Maasailand, especially Ngorongoro—where the Maasai are being restricted (no cultivation) and forcefully displaced from. Note, there is little (or undiscernible) change since 1995 from these images. Furthermore, the Loliondo area is where hunting safaris are increasingly located, which impacts the natural ecosystems of biodiversity. Note, p. 61, "…most fires are caused by human activities particularly farm preparation. Driving forces include game hunting, honey collection, charcoal burning, and burning to simultaneously improve pasture quality.…"

[7] Stephanie McCrummen. '"This Will Finish Us:" How Gulf Princes, the Safari Industry, and Conservation Groups Are Displacing the Maasai from the Last of Their Serengeti Homeland." (*The Atlantic*, 8 April 2024) 24.

[8] Gord Vaadeland, "Grasslands, Forests & Wetlands - Nature's Carbon Capture & Storage Solution," *CPAWS*, 22 March 2016, https://cpaws.org/grasslands-forests-wetlands-natures-carbon-capture-storage-solution/.

[9] Katherine E. Kerlin, "Grasslands More Reliable Carbon Sink Than Trees," *University of California–Davis*, 9 July 2018, https://climatechange.ucdavis.edu/climate/news/grasslands-more-reliable-carbon-sink-than-trees.

5. Quotes from Resource Articles and Books

1. Creation Care & Environmental Stewardship

- **Hayhoe, Katharine** (Climate Scientist and Evangelical Christian) "Caring for the earth is an expression of our love for God and for our neighbors and should be an essential part of the Christian mission in the world."
- **Maathai, Wangarĩ** (Kenyan Environmentalist and Nobel Laureate) *The Challenge for Africa* (2009) "Indigenous knowledge and traditions can teach us valuable lessons in environmental stewardship and how to live in harmony with the land, honoring both creation and the Creator."

2. Ecotheology & Spirituality

- **Njoroge, Nyambura J.** (African Theologian) "For African communities, creation care is not only an ecological practice but a spiritual one, deeply rooted in our cultural beliefs about the sacredness of the earth and its connection to the divine."

3. Gender & Environmental Justice

- **Wright, Beverly.** (Women's Environmental Advocate) "Women's roles in environmental conservation are not just about resource management, but also about preserving the sacred relationships between community, land, and God."

4. Maasai Ecological Practices & Sustainability

- **Bertram, Chris, and Chantal Vivier.** *Pastoralism and Development in Africa: Dynamic Change at the Margins*. Routledge, 2018. "Understanding Maasai environmental practices reveals the intricate connection between pastoral lifestyles and sustainable land management, highlighting how traditional knowledge can contribute to modern environmental solutions."
- **Homewood, Katherine.** *Ecology of Pastoralism: The Maasai of East Africa*. Routledge, 2019. "The Maasai's ecological practices, grounded in traditional knowledge, reflect a sophisticated understanding of environmental balance and sustainability, essential for the long-term health of their landscapes."
- **Nugent, Paul.** *Smelling the Roses: Land Use and Livelihoods among the Maasai*. Oxford University Press, 2009. "The Maasai's land management strategies, including their rotational grazing systems, are not merely traditional practices but reflect a deep-seated ecological wisdom that ensures resource sustainability."

5. Traditional Knowledge and Environmental Stewardship

- **Maathai, Wangarĩ.** *The Challenge for Africa*. Pantheon Books, 2009. "Indigenous practices, such as those of the Maasai, offer invaluble lessons in environmental stewardship, illustrating how traditional knowledge can inform and enhance modern conservation efforts."
- **Spear, Thomas.** *The Maasai of Matapato: A Study of Rituals of Rebellion.* University of Chicago Press, 1981. "Maasai rituals and cultural practices are intertwined with environmental stewardship, demonstrating how cultural norms can shape and sustain ecological practices."

6. Sustainable Pastoralism

Pastoralism Making variability work

Source: Food and Agriculture Organization of the United Nations (FAO). 2021. Pastoralism – Making variability work. FAO Animal Production and Health Paper No. 185. Rome. https://doi.org/10.4060/cb5855en; Creative Commons Attribution-NonCommercial ShareAlike 3.0 IGO licence. Page numbers listed refer to the document's pages.

A specialization in taking advantage of variability

Working with the natural environment

Pastoralism "refers to a wide family of livestock-based, livelihood and food production systems that are highly diverse but that all share a specialization in improving animals' diets (and welfare) by managing their grazing itineraries at a variety of scales in time and space. Better nourished animals are healthier and more productive. Adding value by managing grazing itineraries requires adaptation to levels of variability that are characteristic of natural environments, especially the ways in which temporal and spatial variability in the distribution of moisture combines with the diversity of plant species and differences in soil and terrain morphology to result in sequences of short-lived concentrations of potential inputs. The place and time of such concentrations cannot be predicted from one year to the next, but the concentrations can be used by pastoralists who are able to arrive at the right place at the right time, and by animals that are able to benefit from the opportunities created by their herders. For this reason, pastoralism is also described as a specialization in taking advantage of variability (p. 3).

"Pastoralism is based on close interactions among animals, humans and their environment. In this document, this characteristic is referred to as working with the natural environment, not simply extracting fodder or water but actually increasing resources for livestock, and doing so in ways that make the circular interaction with the ecosystem a constitutive part of the pastoral system itself (p. 5).

"Pastoralists pay great attention to their animals' behaviour and skills, trying to influence and improve them and secure their continuity in the breeding population. Production systems centred on proved knowledge and integrated landscape management offer great latitude for creating 'health' for soil, plants, wild and domestic animals, people and the climate (p. 5).

"Pastoralism takes advantage of the variability in potential inputs – which are maximized and turned into actual inputs – by matching it with the variability (or "flexibility" or "optionality") in its own operational processes. Mobility and flexible land tenure systems are the most obvious examples of variability embedded in the operational processes of pastoralism (p. 6).

"Pastoralism's specialist approach makes it not only a sustainable livestock system, but also a vantage point from which to obtain a particularly clear and open view of the much-needed reconsideration of agriculture and food systems in relation to resilience and climate change. Around the world, pastoral systems have effectively managed to produce food with the natural environment rather than in antagonism with it. This alone deserves attention and the mobilization of efforts to better understand, secure and promote the specialization of pastoralism" (p. 8).

Pastoralism provides a host of benefits

Climate Change

"Pastoralism has the potential to contribute to both adaptation to and mitigation of climate change. Pastoralism requires little fossil energy and is solar powered, as animals walk to their naturally grown feed instead of having it cultivated and transported to them" (p. 12).

17. Resources for Lesson 3:

Climate Science for a Pastoralist Maasai Context

Resources below:

1. Maasai: Helpful information for teachers about the Maasai culture
2. Climate Change Mitigation and Adaptation
3. Climate Change Mitigation and Adaptation in a Pastoralist Maasai Context (table)
4. Maasai Context: Mitigation (prevention) and Adaptation (risk reduction): "Smile" Pits, Fuel-efficient stoves, Water Catchment or Reservoir
5. Teaching Notes on Hope: Wangarĩ Maathai and Jane Goodall
6. Global Warming Temperature Increase (image)
7. Sources of Greenhouse Gases (image)
8. Global-warming Gases Percent Effect on Climate Change (table)
9. Increase of Carbon Dioxide in the Atmosphere (CO_2) (image)
10. Methane Facts (CH_4)
11. If more time, here are more teaching suggestions
12. Additional Resources: Books and Articles

1. Maasai: Helpful information for teachers about the Maasai culture

- When the rains come, the Maasai move their herds to new pastures, allowing the land to recover and grow fresh grass. This rotational grazing ensures that the land remains fertile and productive. The Maasai have inherited this practice from their ancestors, who understood that balance and respect for the land were key to their survival.
- In the dry season, when the earth cracks under the relentless sun, the Maasai must travel long distances to find water sources for their herds. The Maasai know where to find hidden springs and seasonal rivers, passed down through generations of knowledge. Water is not just a resource; it is a lifeline, a critical element that shapes their movements and daily routines.
- The Maasai community, known for their rich cultural heritage and traditional pastoralist lifestyle, has long depended on the natural environment for their livelihood. However, in recent years, the effects of climate change such as unpredictable rainfall, prolonged droughts, and diminishing grazing lands have posed significant challenges to their way of life. Therefore, integrating climate science into the Maasai context is crucial for understanding these changes and developing strategies to adapt and thrive in a changing environment.
- By blending modern climate science with the Maasai's traditional ecological knowledge, we can create a holistic approach that respects cultural practices while promoting sustainable solutions. This integration not only empowers the Maasai to protect their environment and sustain their livelihoods but also enriches their understanding of the world around them, fostering resilience in the face of climate challenges.

2. Climate Change Mitigation and Adaptation

Mitigation: Focuses on reducing global-warming (greenhouse) gases

- Mitigation centers on the root cause of climate change: the heat-trapping greenhouse gases humans are adding to the atmosphere faster than our planet can absorb them. These can be addressed by reducing the sources of greenhouse gas emissions, or enhancing "sinks" of greenhouse gases that remove them from the atmosphere.
- **Reducing sources:** Almost three-quarters of humans' greenhouse gas emissions come from burning fossil fuels like coal, oil and natural gas,[2] so mitigation often focuses on replacing those fuels with other sources of energy, like renewables and nuclear power. Mitigation can also tackle other sources of greenhouse gases: protecting forests from being cut down, for instance, or collecting methane from landfills.
- **Enhancing sinks:** Other forms of mitigation, like growing new forests and designing and building "direct air capture" systems, work by taking greenhouse gases out of the atmosphere—sometimes called "carbon removal." These approaches are challenging to do at a very large scale, and they do not eliminate the need to drastically lower our emissions. Still, authorities like the Intergovernmental Panel on Climate Change agree that some carbon removal will be needed to head off the worst climate change scenarios.[3]

Adaptation: Focuses on reducing the risk of negative impacts from climate change

- If mitigation is successful worldwide, then one day greenhouse gases will stop building up in the atmosphere, and the planet will slowly stop warming. Even so, we will already have created a hotter world, changed the Earth's weather patterns, and "locked in" some future changes—like sea level rise, which may continue for hundreds of years after the Earth's temperature stabilizes.
- Adaptation to these changes will vary from place to place. Often, it involves building or retrofitting infrastructure, like a better storm drain system to manage increased flooding. But adaptation can also include natural solutions, like restoring wetlands to buffer hurricanes, or behavior and policy changes, like growing new food crops that can better handle warmer seasons and droughts.
- Ideally, adaptation is proactive, building systems to withstand not only current but future climate change. In Bangladesh, one of the most vulnerable countries in the world to sea level rise and saltwater intrusion, the port city of Mongla is investing in embankments, drainage, flood-control gates and water treatment to get ahead of rising waters, and economic development to provide refuge and work opportunities for thousands of people displaced from nearby towns. Areas that don't take early steps like these will find themselves adapting reactively: rebuilding after climate change has already destroyed buildings, forced people from their homes, and taken livelihoods and lives.

Source: https://climate.mit.edu/explainers/mitigation-and-adaptation; Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International license (CC BY-NC-SA 4.0)

3. Climate Change Mitigation and Adaptation in a Pastoralist Maasai Context

Mitigation	Adaptation	Kupunguza	Kukabiliana
1. Plant trees which absorb CO_2 (especially trees that are native to the area).	**5. Water** h) Develop water harvesting and storage mechanisms.[3] i) In acute water scarcity, temporarily migrate to areas where water is accessible. j) Develop water catchment areas (reservoirs) boreholes, piped water, and dams.[4] [See Resources Chap. 17.]	**1. Panda miti ambayo inachukua kaboni dioksidi, CO_2** (hasa miti ambayo ni ya asili ya eneo la hilo).	**5. Maji** h) Tengeneza njia za kuvuna na kuhifadhi maji. i) Katika uhaba mkubwa wa maji, hamia kwa muda kwenye maeneo ambayo maji yanapatikana. j) Kuendeleza maeneo ya kukusanyia maji, visima, maji ya bomba, na mabwawa.[4] [Tazama picha hapa chini katika Nyenzo sura ya 17.]
2. Energy efficiency (reducing carbon) a) Use more efficient wood burning cooing stoves to reduce burning of wood (which puts global-warming gases into the environment).[1] [See Resources Chap. 17 for an example stove.] b) Increase the use of renewable energy such as solar power. c) Use energy efficient LED lights or compact fluorescent lights (CFLs) instead of old incandescent light bulbs. d) Turn off electrical lights when not being used.	**6. Food security** k) Put in place food security enhancement strategies (food reserve).[5] l) The households' ability to purchase food is the most important food security strategy.[6] m) A reliable income source and asset base is crucial for household response to climate shocks.[7] n) 58% reported that they resort to selling livestock... in response to shocks.[8] **7. Infrastructure resilience** o) More secure house and facility locations p) Preventive and precautionary measures (evacuation plans, health issues, etc.) **8. Ecosystem and landscapes** q) Landscape restoration (natural landscape) and reforestation r) Conservation of natural ecosystem (biodiversity and water) **9. Traditional environmental knowledge** s) Identify and sustain indigenous/traditional Maasai knowledge with practices that are good for caring for the environment; "...local knowledge systems and institutions should buttress policy-making and implementation to promote local resilience."[9] t) "Gradual and medium to long-term livelihood diversification initiative is a highly recommended	**2. Ufanisi wa nishati (kupunguza kiwango cha kaboni)** a) Tumia majiko ya kuni yenye ufanisi zaidi ya kuni ili kupunguza uchomaji wa kuni (ambao huweka gesi zinazoongeza joto kwenye dunia kwenye mazingira).[1] [Tazama Nyenzo sura ya 17 kuhusu kuchoma biomasi chini na mfano wa jiko linalotumia mafuta kidogo.] b) Kuongeza matumizi ya nishati mbadala kama vile nishati ya jua. c) Tumia taa za LED zisizo na nishati au taa za fluorescent (CFL) badala ya balbu za zamani za incandescent. d) Zima taa za umeme wakati hautumiki.	**6. Usalama wa chakula** k) Weka mikakati ya kuimarisha usalama wa chakula (hifadhi ya chakula).[5] l) Uwezo wa kaya kununua chakula ndio mkakati muhimu zaidi wa usalama wa chakula.[6] m) Chanzo cha mapato kinachotegemewa na msingi wa mali ni muhimu kwa mwitikio wa kaya dhidi ya majanga ya tabia nchi.[7] n) Asilimia 58 ya kaya ziliripoti kuwa zimeamua kuuza mifugo...ili kudhibiti majanga ya tabia nchi.[8] **7. Ustahimilivu wa miundombinu** o) Maeneo salama zaidi ya nyumba na kituo p) Hatua za kuzuia na za tahadhari (mipango ya uokoaji, masuala ya afya, n.k.) **8. Mfumo wa ikolojia na mandhari** q) Marejesho ya mazingira (mandhari ya asili) na upandaji miti upya r) Uhifadhi wa mfumo ikolojia asilia (bioanuwai na maji) **9. Maarifa ya jadi ya mazingira** s) Tambua na udumishe maarifa asilia/jadi ya Wamaasai na mazoea ambayo ni mazuri kwa kutunza mazingira; "...mifumo na taasisi za maarifa za wenyeji zinapaswa kuimarisha utungaji na utekelezaji wa sera ili kukuza ustahimilivu wa wenyeji."[9]
3. Reduce the use of plastic bottles and recycle the bottles that are used.		**3. Punguza matumizi ya chupa za plastiki na urejeshe tena chupa zinazotumika.**	

Mitigation	Adaptation	Kupunguza	Kukabiliana
e) Because single-use plastic is produced from fossil fuels, obtaining and creating these plastics produces large amounts of global-warming gases. f) Burning plastics puts toxic chemicals into the air and land that is harmful to health.[2] **4. Use garbage collection instead of burning garbage.** g) Burning garbage releases carbon into the air. (See note "f" on burning plastic.)	policy strategy to increase resilience among pastoral communities as opposed to the current policy which condemns pastoralism as a backward and environmentally destructive activity."[10] **10) Agro-pastoralism/small-scale agriculture** u) Use flexible and diverse cultivation v) Develop seed banking.[11] w) Incorporate crops that are more drought resistant than maize, "such as sorghum, pigeon-pea, finger millet, sweet potato and chickpea…"[12] **11) Leadership and governance** x) Include women in decision making that affects their and their children's lives to reduce the vulnerability of the entire household y) Strengthen local traditional leaders as the elders are in charge of resource control and allocation especially during periods of intense scarcity[13] and provide infrastructural, social, legal, and financial support z) Strengthen the village council for how to seek government support…for infrastructural, social, legal, and financial support.[14]	e) Kwa sababu plastiki ya matumizi moja huzalishwa kutoka kwa nishati ya mafuta (kama petroli), kupata na kuunda plastiki hizi hutoa kiasi kikubwa cha gesi za joto za dunia. f) Tumia ukusanyaji wa taka badala ya kuchoma takataka.[2] **4. Takataka zinazochomwa hutoa kaboni hewani.** g) Kuchoma plastiki huweka kaboni dioksidi na kemikali za sumu katika hewa na ardhi ambayo ni hatari kwa afya ya binadamu na wanyama na mazingira. (Angalia maelezo "f.")	t) "Mpango wa mseto wa maisha wa taratibu na wa kati hadi mrefu ni mkakati wa kisera unaopendekezwa ili kuongeza ustahimilivu miongoni mwa jamii za wafugaji kinyume na sera ya sasa inayolaani ufugaji kuwa ni shughuli ya kurudi nyuma na kuharibu mazingira."[10] **10. Kilimo-ufugaji/kilimo kidogo** u) Tumia njia rahisi na tofauti za kilimo. v) Kuendeleza utunzaji wa mbegu.[11] w) Jumuisha mazao yanayostahimili ukame zaidi kuliko mahindi, "kama vile mtama, njegere, mtama, viazi vitamu na kunde."[12] **11. Uongozi na utawala** x) Wajumuishe wanawake katika kufanya maamuzi ambayo yanaathiri maisha yao na ya watoto wao ili kupunguza hatari ya kaya nzima. y) Waimarishe viongozi wa kimila kwani wazee ndio wanaosimamia udhibiti na ugawaji wa rasilimali hasa nyakati za uhaba mkubwa,[13] na kutoa msaada wa miundombinu, kijamii, kisheria na kifedha. z) Imarisha halmashauri ya kijiji jinsi ya kutafuta msaada wa serikali…kwa msaada wa miundombinu, kijamii, kisheria na kifedha.[14]

See p. 117–118 for a Kiswahili and Maa table.

Table Bibliography

[1] Ndesanjo, Theilade, and Nielsen. "Water scarcity is a common determinant of migration among pastoral communities." (Berkhout 2012; Brockhaus et al. 2013). 2602, https://doi.org/10.1007/978-3-030-45106-6_128.

[2] Verma et al., "Toxic Pollutants from Plastic Waste-A Review," *Procedia Environmental Sciences*, Waste Management for Resource Utilisation, 35 (January 1, 2016): 701–8, https://doi.org/10.1016/j.proenv.2016.07.069.

[3] Ndesanjo, Theilade, and Nielsen, 2603.

[4] Mwandosya, "National Adaptation Programme of Action (NAPA)," 2007, ix, https://unfccc.int/resource/docs/napa/tza01.pdf.

[5] Ndesanjo, Theilade, and Nielsen, 2601.

[6] Ndesanjo, Theilade, and Nielsen, 2601.

[7] Ndesanjo, Theilade, and Nielsen, 2602.

[8] Ndesanjo, Theilade, and Nielsen, 2601.

[9] Mwandosya, ix.

[10] Ndesanjo, Theilade, and Nielsen, 2607.

[11] Ndesanjo, Theilade, and Nielsen, 2601.

[12] J. Douwe Meindertsma and Jan J. Kessler, eds., 44. Meindertsma, J. Douwe, and Jan J. Kessler, eds. Planning for a Better Environment in Monduli District. Netherlands Economic Institute, 1997.

[13] Ndesanjo, Theilade, and Nielsen, 2604.

[14] Ndesanjo, Theilade, and Nielsen, 2605.

4. Maasai Context: Mitigation (prevention) and Adaptation (risk reduction)

"Smile" Pits (Mitigation)

Digging many small 2-meter wide half circles—"smile" pits—"regreens" the area with plants that take out CO_2 from the air (and also reduces soil erosion).

- One recent example from the Lead Foundation: The Regreening Arusha Program's "goal is to reach more than 3,600 households in Monduli district and restore at least 86,400 trees and 440 hectares of rangeland. This is achieved by reversing the process of desertification and degradation of ecosystems through the techniques of Kisiki Hai and Rainwater Harvesting in order to improve livelihoods and climate change resilience.
- See the amazing pictures at the link provided to see the Regreening Arusha Program: https://leadfoundation.org/service/regreening-arusha-program/
- See a short documentary of this Lead Foundation project in Engaruka at the link provided: https://www.youtube.com/watch?v=RPJ9T4yAEGs&t=4s (7:08 minutes)

Fuel-efficient stoves for the Maasai (Mitigation)

In Ketumbeine, Maasai women in the Naapok Bead Project are trained to build fuel-efficient stoves. These fuel-efficient stoves:

- Reduce the burning of firewood by 60% (less work to collect and haul wood),
- Reduce the smoke in the home by 90% (less respiratory diseases) and
- Reduce the number of children burned by cooking fires.
- See also: https://internationalcollaborative.org/news-resources/

(Photos: Beth E. Elness-Hanson; with permission)

Water Catchment or Reservoir (Adaptation)

This reservoir is in the Nanja area and was hand dug with the cooperation of 3 or 4 neighboring families who all share the water. The rain collects during the rainy season and fills the reservoir. The thorn fence keeps animals out, so it is cleaner water. The water sustains the community for most of the dry season. Then, they dig out the bottom, bringing the soil to the top of the sides of the reservoir to make it deeper. (Photo: Beth E. Elness-Hanson, with permission)

5. Teaching Notes on Hope: Wangarĩ Maathai and Jane Goodall

Jane Goodall

Goodall began her career in 1960 in Gombe National Park, Tanzania.

"Hope is what enables us to keep going in the face of adversity."[1] "I truly believe, and I'm not alone as a scientist, that we have a window of time when if we get together and take action, we can at least slow down climate change and loss of biodiversity…I can't save the world, but what can I do locally?…Whatever it is you care about, get together with some friends and take action. Do what you can do to solve what you are passionate about and you will find you make a difference."[2]

[1] Goodall, Jane. *The Book of Hope: A Survival Guide for an Endangered Planet*. Viking, 2022.
[2] Goodall, Jane. '"Reasons for Hope" About the Planet's Future, Greater Boston, GBH News'. 29 September 2023. https://www.youtube.com/watch?v=LXXb5MjPbPI.

Photo: Nicolas Richoffer; https://commons.wikimedia.org/wiki/File:Jane_Goodall_2010.jpg;
Creative Commons Attribution-Share Alike 4.0 International licens

Prof. Wangarĩ Maathai: Kenyan Woman Awarded Nobel Peace Prize (2004)

Wangarĩ Muta Maathai (1940–2011) "was a Kenyan social, environmental, and political activist who founded the Green Belt Movement, an environmental non-governmental organization focused on the planting of trees, environmental conservation, and women's rights. In 2004 she became the first African woman to win the Nobel Peace Prize."[1]

- "…for her contribution to sustainable development, democracy and peace." Wangari Maathai was the first African woman to receive the Nobel Peace Prize. She was also the first female scholar from East and Central Africa to take a doctorate (in biology), and the first female professor ever in her home country of Kenya. Maathai played an active part in the struggle for democracy in Kenya, and belonged to the opposition to Daniel arap Moi's regime.
- "In 1977 she started a grass-roots movement aimed at countering the deforestation that was threatening the means of subsistence of the agricultural population. The campaign encouraged women to plant trees in their local environments and to think ecologically. The so-called Green Belt Movement spread to other African countries, and contributed to the planting of over thirty million trees.
- Maathai's mobilisation of African women was not limited in its vision to work for sustainable development; she saw tree-planting in a broader perspective which included democracy, women's rights, and international solidarity. In the words of the Nobel Committee: "She thinks globally and acts locally."[2]

"The 30 million trees planted by Green Belt Movement volunteers—mostly rural women—throughout Kenya over the past 30 years are a testament to the individuals' ability to change the course of environmental history.

"Working together, we have proven that sustainable development is possible; the reforestation of degraded land is possible; and the exemplary governance is possible when ordinary citizens are informed, sensitized, mobilized and involved in direct action for their environment."[2]

[1] Source: https://en.wikipedia.org/wiki/Wangar%C4%A9_Maathai

[2] Source: https://www.nobelprize.org/prizes/peace/2004/maathai/facts/

[2] Wangari Maathai. *The Green Belt Movement: Sharing the Approach and the Experience*. Revised edition. (Lantern Publishing & Media, 2003) xi. See also: Maathai, Wangari. *Replenishing the Earth: Spiritual Values for Healing Ourselves and the World*. Random House, 2010.

6. Global Warming Temperature Increase

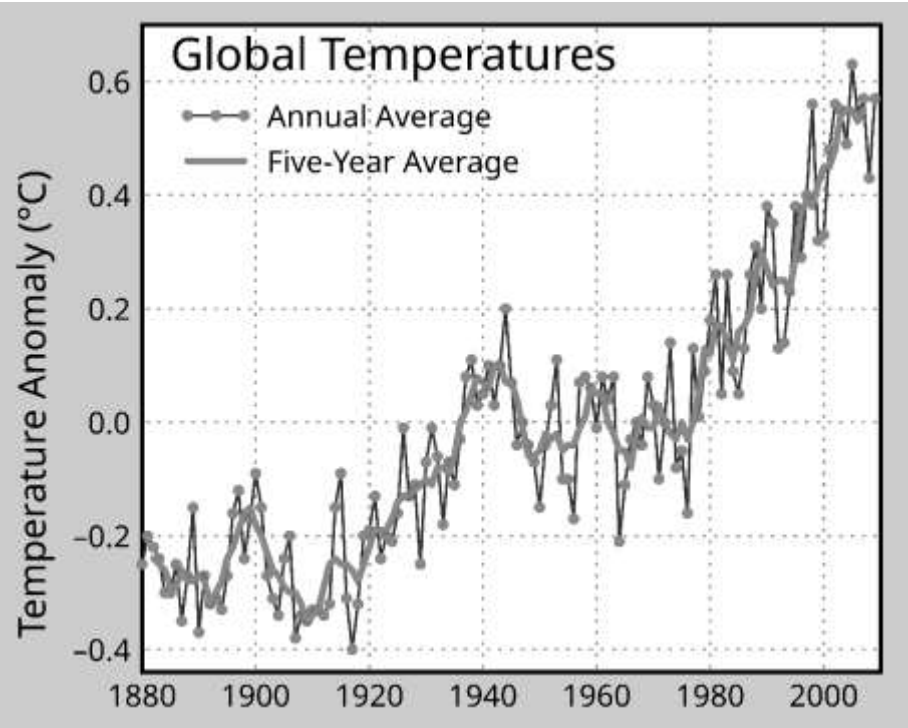
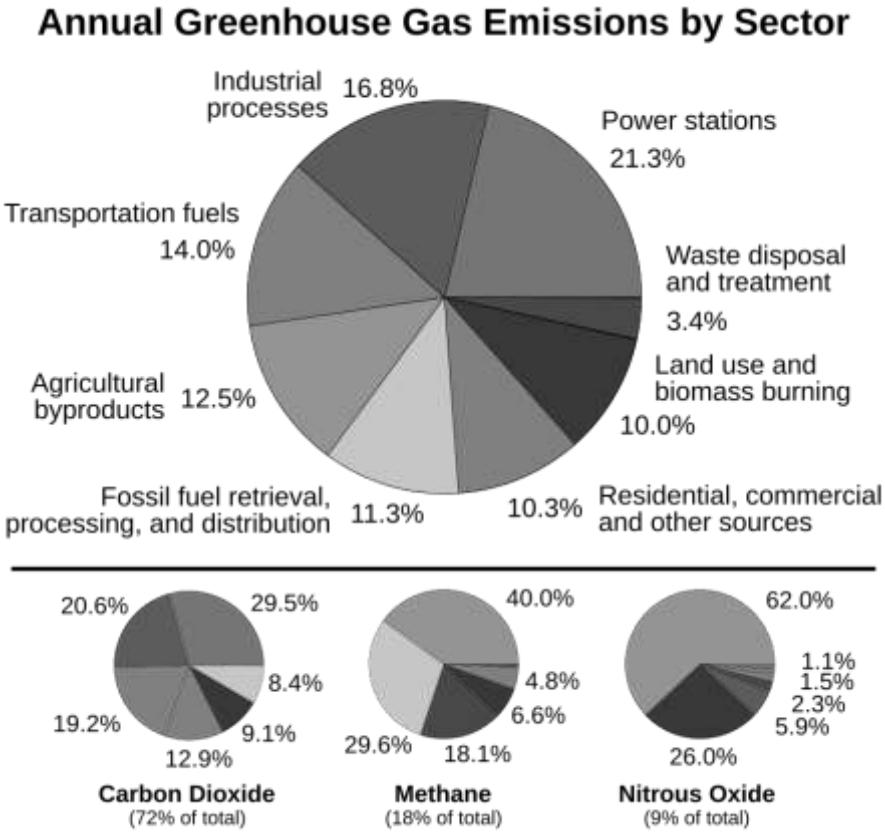


Image: Public Domain, Author, Schapel: Instrumental Temperature Record GISS.svg Instrumental Temperature Record GISS - File:Instrumental Temperature Record GISS.svg - https://commons.wikimedia.org/wiki/File:Instrumental_Temperature_Record_GISS.svg

7. Sources of Greenhouse Gases Image



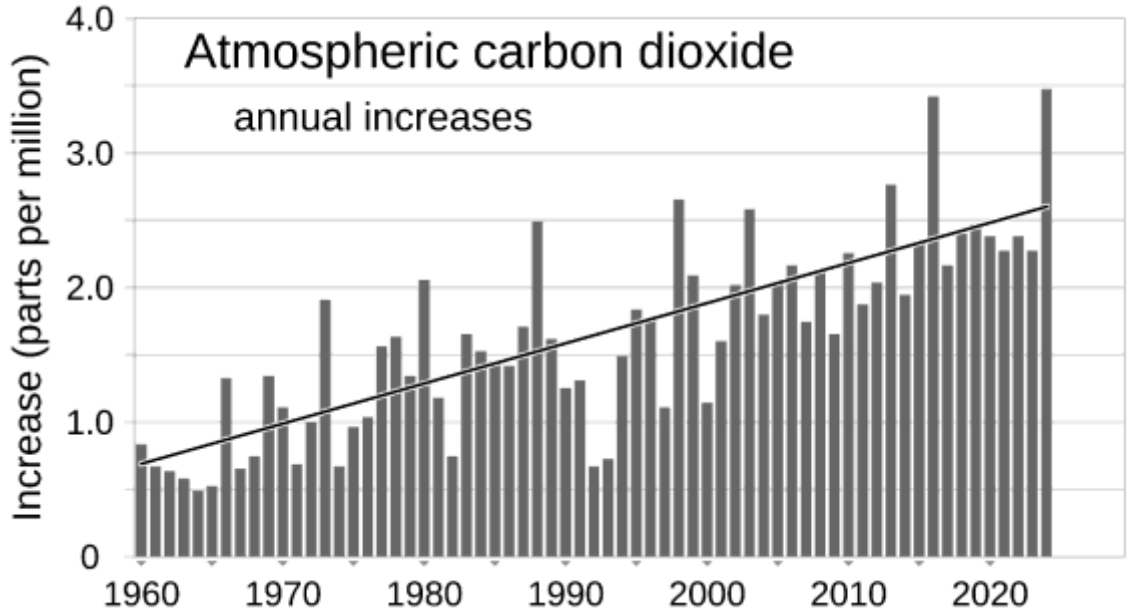
Source: https://commons.wikimedia.org/wiki/File:Greenhouse_gases.svg Greenhouse Gas by Sector.png: Robert A. Rohde, Creative Commons Attribution-Share Alike 3.0 Unported license.

8. Global-warming Gases Percent Effect on Climate Change

Source: https://commons.wikimedia.org/wiki/File:Greenhouse_Gases.jpg; Public Domain (modified, expanded info)

Effect on climate	Chemical formula	Name	Source
60%	CO_2	carbon dioxide	burning fossil fuels (like coal and petrol in cars) deforestation, wildfires, burning wood
16%	HFCs	hydrofluorocarbons	refrigerants, aerosol propellants in medicinal applications, and degreasing solvents
15%	CH_4	methane	wetlands, organic waste, livestock, modern agriculture, burning biomass
5%	N_2O	nitrous oxide	fertilizers, fuels, medical uses, rocket propellants, and motorcar racing
2%	PFCs	perfluorocarbons	paint, textile and aluminum production
1%	SF_6	sulpher hexaflouride	electrical industry, rubber production
1%	H_2O	water vapor	irrigation, evaporation of rain, ice melting

9. Increase of Carbon Dioxide in the Atmosphere (CO_2)



Source: RCraig09, Creative Commons Attribution-Share Alike 4.0 International license.
https://commons.wikimedia.org/wiki/File:1960-_Annual_increases_in_atmospheric_carbon_dioxide.svg

10. Methane Facts (CH_4)

- Approximately 40% of methane gas emissions are from natural sources.
- The rest (60%) is produced by human activity, known as anthropogenic emissions.
- The largest human-caused source of methane is agriculture, which produces aboue one quarter of methane emissions.
- closely followed by the energy sector, which includes emissions from coal, oil, natural gas and biofuels. (https://www.iea.org/reports/global-methane-tracker-2022/methane-and-climate-change)

11. If more time, here are more teaching suggestions

- **Adapt Teaching Materials to Different Maasai Regions:** While the core lesson is relevant across Maasai communities, consider adjusting examples or activities based on the specific challenges faced in different regions (e.g., water scarcity, soil degradation).
- **Local Experts:** Consider inviting local environmental experts or Maasai elders who practice sustainable land management to share their experiences and knowledge.
- **Study and teach others about the Maasai:** including traditional practices, beliefs, and their deep connection to the land. Understanding their cultural heritage helps appreciate their way of life.
- **Engage with Maasai community leaders and members** to hear their perspectives on climate change and environmental issues. Their traditional knowledge and experiences provide valuable insights into adapting to changes.
  - "How did our ancestors take care of the land and animals to ensure they stay healthy?"
  - "What natural signs do you look for to know when it's time to move the cattle or plant crops?"
  - "How do you make sure that water sources and pastures are used wisely and not overused?"
  - "What lessons from the past can we use today to protect nature and our way of life?"
  - "How did the elders in our community teach you to care for the environment when you were young?"
  - "In your view, how has the climate changed over the years, and what did you do to adapt?"
- **Integration of Maasai Tradition and Modern Science:**
  Objective: Show how combining Maasai traditional knowledge with modern climate science can lead to effective climate action. Here are the instructions:
  - Discussion (5 minutes):
    - **Ask:** "How can we use our Maasai traditions alongside modern science to tackle climate change?"
    - Discuss how traditional Maasai practices, such as sustainable land and water management, align with modern scientific methods for mitigating and adapting to climate change.
  - Class Activity (5 minutes):
    - **Pair Work:** In pairs, students discuss how a traditional Maasai practice could be combined with a modern climate solution. For example, traditional water conservation methods could be paired with modern rainwater harvesting techniques, or traditional grazing methods could be adapted with modern sustainable farming practices.
    - **Class Sharing:** Invite students to share their ideas with the class.
- **Real-Life Examples**: Take students on a visit to a Maasai community or a local farm where they can see how people are adapting to climate change. This helps them learn directly from the community's practices.
- **Talk to Elders:** Students can ask their grandparents (babu or koko) about how they adapt to changes in the weather and environment. These stories can be shared in class to learn from past generations. Here's a question that students can ask their grandparents (babu or koko) about adapting to changes in the weather and environment:
  - "Babu/Koko, how did you and people in your time adjust to changes in the weather or environment? Have you noticed any differences in how the weather is now compared to when you were younger?"
  - This question encourages grandparents to reflect on their personal experiences and observe any environmental changes over time, helping bridge the generational gap and connect traditional knowledge with current environmental shift.

12. Additional Resources: Books and Articles

Combining Climate Science and Traditional Maasai Knowledge

- **Brockington, Dan, and Jim Igoe.** *Pastoralism and Climate Change: Bridging Science and Indigenous Knowledge*. Routledge, 2017. Highlights how connecting science with Maasai traditions creates culturally relevant climate solutions.
- **Homewood, Katherine and Trench, Pauline.** *Climate Change and the Future of Pastoralism in Africa: A Maasai Case Study*. Routledge, 2022. Explores how blending climate science with Maasai traditional knowledge helps address climate change's impacts on pastoralism.
- **Leach, Melissa, and Scoones, Ian.** *Sustainable Livelihoods and Climate Change: The Maasai and Beyond*. Routledge, 2021. Focuses on merging climate science with indigenous systems to build effective adaptation strategies.
- **Moss, Keith.** "Climate Change Adaptation Strategies Among the Maasai: Integrating Traditional Knowledge and Climate Science." Global Environmental Change, vol. 40, 2022, pp. 100–112. Discusses how blending Maasai knowledge with climate science creates culturally suitable and effective adaptation strategies.
- **Ogutu, Joseph O., and Owen-Smith, Norman.** "Integrating Indigenous Knowledge and Climate Science for Pastoralist Adaptation: Lessons from the Maasai." Pastoralism: Research, Policy and Practice, vol. 9, no. 1, 2018, pp. 23–37. Explores how integrating indigenous knowledge and science can strengthen resilience and adaptation.

Building Adaptation and Resilience

- **Gibson, Craig C., and Stephen A. Marks.** *Integrating Climate Adaptation into Maasai Pastoralism: Policy and Practice.* Cambridge University Press, 2019. Examines how scientific and traditional insights can foster resilience against environmental challenges.
- **Homewood, Katherine.** "The Impact of Climate Change on Maasai Pastoralism: A Review of Current Knowledge and Future Directions." Environmental Science & Policy, vol. 70, 2021, pp. 1–10. Reviews how combining science with Maasai practices aids in addressing climate variability impacts.
- **Ndegwa, Samwel.** "Climate Change and Pastoralism: Analyzing the Maasai Adaptation Strategies in the Context of Climate Science." African Journal of Environmental Science and Technology, vol. 15, no. 2, 2018, pp. 91–105. Examines how Maasai strategies informed by both tradition and science showcase the potential for integrated climate management.
- **Nugent, Paul.** *The Climate Crisis and Pastoralism: Insights from the Maasai*. Oxford University Press, 2020. Discusses adaptive strategies that integrate scientific and ecological practices of the Maasai.

Appendix A:

Climate Change Vocabulary in English, Kiswahili, and Maa

Initial Maa translation by Mr. Lashumbai Kilolong. Dr. Neema Kitasho and Mr. Julius Laiser continued with the development of the concepts. Additional contributions by Dr. Daniel Kosia Mokoro and Mr. Joseph Kosia. This is a vocabulary in development.

English	Kiswahili	Maa
Maasai indigenous knowledge for the care and protection of creation	maarifa ya asili ya Wamaasai kwa ajili ya kujali na utunzaji wa uumbaji	eng′eno e tipat oo Irmaasai narripyeki inkitobirunot
traditional Maasai knowledge of care for the environment	maarifa ya kitamaduni ya Wamaasai kuhusu utunzaji wa mazingira	eng′eno/engarriyiano o orreje lo ilmaasai narripyeki enkop
adaptation	ustahimilivu	emokunotto/eng′iryata
average surface temperature	joto wastani la eneo	enkirowuaj te enkop
biodiversity	bioanuwai	iseuseu enkop
biofuel	nishati itokanayo na mabaki mimea	engima empuuti oo ingaitubulu
carbon dioxide	kaboni dioksidi	enkijape e kabon
carbon footprint	kanyagio za kaboni	iraruat e kabon
carbon neutral	uwiano wa kaboni	kabon nemeponari
caring for the environment	kutunza mazingira	erripoto/enking′urata enkop
clean energy	nishati safi	nishati sidai
climate	tabianchi	orreje le enkop
climate change	mabadiliko ya tabianchi	engibelekenyatta orreje le enkop
compost	mbolea	endulugumi
creation care	utunzaji wa uumbaji	enking′urata/erripoto o ingitobirat
deforestation	ukataji wa miti	endung′oto orkeek
drought	ukame	alamei
eco-friendly	rafiki wa ikolojia	naning′ore iltirenito

English	Kiswahili	Maa
ecosystem	mfumo wa kiikolojia	enchula oopookin toltiren
emissions	utoaji wa gesi hatari au gesi la joto duniani	emburuo torrono/engijape nainyalisho
energy-efficient	nishati fanisi	enishati/enkima nanarikino
environment	mazingira	enkop
environmental care	kutunza mazingira	enking′urata/erripoto enkop
exhaust fume	moshi wa magari	emburuo oo motokaani
extinction	kutoweka	engidaaya/enkiting′oto
extreme weather event	tukio kali la hali ya hewa	erishata sapuk enkijape enkop
famine	njaa	esumash/alamei
flood	mafuriko	ingarriak sapukin naaruko
food waste	mabaki taka ya chakula	irmong′oitie loon′daikin
fossil fuels	mafuta ya visukuku	iila e tetroli
global average temperature	wastani wa halijoto duniani	engirowaj rishati te enkop
global warming	ongezeko la joto duniani	emponata engirowaj te enkop
greenhouse effect or blanket effect	athari ya blanketi la joto angani	inaayau, orkila lenkirowaj toloing′ang′e
greenhouse gas (GHG) or global-warming gases	gesi zinazopasha joto dunia or gesi iongezayo joto la dunia (*gesi ya chafu* is not preferred in this project)	irmuumwani ooirowaje enkop
habitat	makazi ya asili	manyisho e tipat
heat wave	wimbi la joto kali	engima nairowua naleng′, ingatitin enkima sapuk
infectious diseases	magonjwa ya kuambukiza	imoyiaretin naahurrtakinoi
mitigation	kupunguza/kudhibiti	engirishata
non-renewable energy	kawi isiyotumika tena nishati isiyojizalisha	enishati nemeponari
ozone	ozoni	erishata olaing′ang′e le ozon
petrol	petroli	petroli
pollutants	vichafuzi	olchafu /enkitarruoroto/altaka

English	Kiswahili	Maa
recycling	kuchakata	enkigilata oonkitobirunot
reforestation	upandaji miti	eunoto orkeek
refugee	mkimbizi	ilaisikak
renewable energy, energy from the sun and wind	nishati jadidifu, nishati kutoka kwa jua na upepo	enishati naponikino, enishati naing′waa engolong′ o osiwuo
reservoir (of water)	hifadhi (ya maji) utunzaji wa maji	en′chumata o inkariak
sea-level rise	kupanda kwa kiwango cha maji baharini	edokunotto engare enaipasha
solar panels	seliumeme za jua	esolla
sunlight	mwanga wa jua	ewang′an engolong′
sustainability	endelevu	nemeiting′/enkata naado
temperature	halijoto	engirowaj
weather patterns	mabadiliko ya hali ya hewa	ingibelekenyat enkijape tolaing′ang′e
weather	hali ya hewa	enkijape
wind	upepo	osiwuo
wind turbine	vinu vya upepo	emashine osiwuo
world	dunia	enkop/olosho

Appendix B:

Website Resource: Visit MamaAnya.com

https://www.mamaanya.com/

- The website also provides all the lessons for downloading without cost. Karibu!
- The lessons are developed to be a blessing for the Maasai.
- Thus, they are shared with a **Creative Commons license, CC BY-NC-SA: Attribution-NonCommercial-ShareAlike**.
- See the colophon/publishing information for more description of the permitted use.
- The website lessons have the potential for corrections of typograpical errors, updated information, and revisions that arise from working with these lesson plans and developing them accordingly. Hopefully, the use and development of the lessons will continue.