Education for Sustainability for High School Students

A textbook for students of EfS at levels 2 and 3

This textbook starts out as a book of questions and will be written as a collaborative project by students of the EfS Volcanics distance learning class of 2022.

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INTRODUCTION

This textbook for students of Education for Sustainability (EfS) courses at Level 2 and Level 3 of the curriculum was generated for the purpose of teaching a mixed L2/L3 class of students in a distance learning program in 2022.

While there are many excellent resources for EfS teaching, what seemed to be missing was a textbook that draws key concepts of sustainability thinking together into a coherent framework that allows students to develop a coherent understanding of sustainability theory at the appropriate level.

This textbook is therefore a skeleton book at present and will be written by the students and edited by the teacher as the course progresses.

Sustainability Illustrated, Youtube Channel
https://www.youtube.com/channel/UCB_yeT6WwVLJjCsZFt2oQfA

This channel offers interesting and thoughtful short videos on many concepts for sustainability thinking.

SUSTAINABILITY IN THEORY

Sustainability, what does this word mean?

Questions:

- What does Sustainability mean?
- What is it that needs to be sustained?
- What is the opposite of sustainability?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Definition of sustainability (Video)
  https://youtu.be/zx04Kl8y4dE

- Wikipedia, good summary
  https://en.wikipedia.org/wiki/Sustainability

- UN, Sustainable Development Goals (SDGs)
  https://sdgs.un.org/

The world today: Why is sustainability thinking essential for humanity's future?

Questions:

- What is the Anthropocene?
- Is the current form of human society sustainable? And if not, why not?
- What are society's most pressing sustainability issues today?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- What is the Anthropocene? (Short Video)
  https://www.smithsonianmag.com/videos/category/science/what-is-the-anthropocene/

- TEDxCanberra - Will Steffen - The Anthropocene (very good introduction presentation)
  https://www.youtube.com/watch?v=ABZjlfhN0EQ

- The Anthropocene: (extensive website with lots of materials)
  https://www.anthropocene.info/

- The Age of the Anthropocene, longer video with experts
  https://youtu.be/AW138ZTKioM

Systems thinking

Here we learn about a key tool for analysing and understanding complex interconnected systems such as those systems that sustain life and human society.

What is "systems thinking"?

Questions:

- What is "systems thinking"?
- What are open, closed and isolated systems?
- Why is systems thinking helpful in analysing and understanding sustainability issues?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- What is Systems Thinking:
  https://www.youtube.com/watch?v=FW6MXqzeg7M

- Systems thinking, a precautionary tale:
  https://youtu.be/17BP9n6g1F0

- More on systems thinking:
  https://serc.carleton.edu/integrate/teaching_materials/themes/expert_thinking/systems_what.html

- An introduction to systems thinking and systemic design – concepts and tools
  https://learningforsustainability.net/pubs/systemicdesign-intro.pdf

- SYSTEMS THINKING CONCEPTS FOR ENVIRONMENTAL EDUCATION
  https://thesystemsthinker.com/systems-thinking-concepts-for-environmental-education/

- Systems Thinking & Sustainability: Live Discussion
  https://www.youtube.com/watch?v=Mgx5RU-VIL8

- Open, Closed and Isolated systems:
  https://www.youtube.com/watch?v=ASzTtp6QZ6Y

The global earth system and its subsystems

Here we take a very broad look at the global Earth-systems and its subsystems that we should know about.

Questions:

- Is the Earth a closed system?
- Describe in broad terms the global earth-system
- Describe some of the sub-systems of the global earth-system
- Can any economic growth be sustained indefinitely in a closed environment?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Earth as a “Closed System” https://www.uvm.edu/~cmehrten/courses/earthhist/Earth%20Closed%20System.pdf
- The Earth Systems: (Science Learn) https://www.sciencelearn.org.nz/resources/1256-what-is-the-earth-system
- Economic growth and the Earth system: https://www.eesi.org/articles/view/the-fairy-tale-of-eternal-economic-growth
- Closed ecosystem in a jar: a model for closed system biotopes. https://sciencespace.com.au/how-to-build-your-own-ecosystem-backyard-science-at-science-space-wollongong/

Bio-physical sustainability and the more-than-human world

Here we take a deeper look at the more-than-human world and the biophysical systems that support all life on Earth.

Energy, the enabler of everything else

Questions:

- What is Energy and how do we measure it?
- Why is Energy so important for everything else?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- What is energy? Science Learn
  https://www.sciencelearn.org.nz/resources/1572-what-is-energy

Solar energy and the earth systems

Here we look at the key role that solar energy and photosynthesis play in enabling life on Earth

Questions:

- How much energy do we get from the Sun each day?
- Why is the solar energy we get from the Sun so important?
- What is photosynthesis and why is it the enabler of all (most) other life on Earth?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Earth's Energy Budget: https://energyeducation.ca/encyclopedia/Earth's_energy_budget

- Solar energy as the enabler of life processes: https://www.sciencelearn.org.nz/resources/1747-using-solar-energy

- Photosynthesis: https://asknature.org/strategy/how-plants-transform-sunlight-into-food/

The cyclical nature of life processes: the carbon, oxygen, and water cycles

Here we look at the three big cyclical processes of matter flow and chemical cycling that supports life on Earth.

Questions:

- What is the carbon cycle? How does it work and why is it fundamental to life?
- What is the oxygen cycle? How does it work and why is it important for life?
- What is the water cycle? How does it work and why is it important for life?
- How does climate change affect the fundamental cycles in Earth's ecology?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Carbon Cycle: (Interactive)
  https://www.sciencelearn.org.nz/image_maps/3-carbon-cycle

- The Ocean and the Carbon Cycle:
  https://www.sciencelearn.org.nz/resources/689-the-ocean-and-the-carbon-cycle

- Oxygen Cycle: (CO_2 and Oxygen Cycle)
  https://gml.noaa.gov/education/lesson_plans/The%20Carbon%20Dioxide-%20Oxygen%20Cycle.pdf

- Water Cycle: (Hydrological cycle)
  https://www.noaa.gov/education/resource-collections/freshwater/water-cycle

- Climate change and the Carbon Cycle:
  https://earthobservatory.nasa.gov/features/CarbonCycle/page5.php

- Climate change and the Water Cycle:
  https://scied.ucar.edu/learning-zone/climate-change-impacts/water-cycle-climate-change

Human impacts on the biophysical systems

Here we look at human impacts on the biophysical systems of the Earth

Climate Change

Here we look at human impacts on the energy balance of Earth and the resulting climate change and its impacts on the sustainability of human civilisation and life on Earth

Questions:

- What has Earth's climate been like in the past?
- What is human-caused climate change?
- What awaits us this century?
- Why is climate change mitigation so important?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Climate Change Basics:
  https://350.org/science/

- Climate change and the top 10 solutions:
  https://youtu.be/z5OYFCDOw7A

- NIWA climate change resources, NZ perspective:
  https://niwa.co.nz/climate-change

- Science Learn, Climate Change portal:
  https://www.sciencelearn.org.nz/topics/climate-change

- IPCC, AR6 Climate Change 2021: The Physical Science Basis
  https://www.ipcc.ch/report/ar6/wg1/

- Prof Will Steffen, 2021, why need to act urgently:
  https://www.youtube.com/watch?v=7nDy4w3vNkk

- The impacts of climate change: (NASA)
  https://climate.nasa.gov/news/2865/a-degree-of-concern-why-global-temperatures-matter/

- World Bank: Turn down the heat. Why a 4 Deg C warmer world must be avoided (PDF) https://openknowledge.worldbank.org/handle/10986/11860

- Steffen et al., 2018, Trajectories of the Earth System in the Anthropocene: https://www.pnas.org/content/115/33/8252

Extractive practices and non-cyclical processes

Here we look at the non-cyclical and extractive practices that underlie many of the non-sustainable ways of society's current life.

Questions:

- What are extractive non-cyclical practices?
- What are the key examples of such processes?
- Why are these processes in conflict with sustainability goals?
- What are New Zealand's extractive practices?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Why do extractive industries matter? UN website
  https://www.unep.org/explore-topics/extractives/why-does-extractives-matter

- Transforming extractive industries for sustainable development, UN
  https://unece.org/sustainable-energy/publications/policy-brief-transforming-extractive-industries-sustainable

- Extractive Industries and sustainable development: UN
  https://www.oecd.org/dev/Session%201C%20-%20Extractives%20and%20SDGs_UNDP.pdf

- Fossil Fuels, the extractive practice that started the industrial revolution:
  https://studentenergy.org/source/fossil-fuels/

- The age of fossil fuels is dead: Article from 2021
  https://www.stuff.co.nz/business/world/300424963/the-age-of-fossil-fuel-abundance-is-dead

- Our World In Data: Fossil Fuels
  https://ourworldindata.org/fossil-fuels

- Energy Returned on Energy Invested, a key concept:
  https://en.wikipedia.org/wiki/Energy_return_on_investment

- Overfishing: Fishing as an extractive practice: https://en.wikipedia.org/wiki/Overfishing

- Deforestation as a non-cyclical extractive practice: https://www.livescience.com/27692-deforestation.html

Waste, cyclical versus non-cyclical processes

Here we look at the waste stream from society. At the moment most waste streams are non-cyclical.

Questions:

- What are society's main waste streams?
- What are the impacts of waste on the environment?
- How can we reform our waste management to make it cyclical?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- The global waste problem is shocking
  https://www.globalcitizen.org/en/content/global-waste-facts-plastic-fashion-food/

- We are drowning in plastic pollution, United Nations
  https://www.unep.org/interactive/beat-plastic-pollution/

- Microplastic pollution, horror or hyperbole? NZ Ecology
  https://newzealandecology.org/ecological-damage-microplastic-pollution-horror-or-hyperbole

- Microplastics may cross the blood-brain barrier:
  https://www.the-scientist.com/reading-frames/opinion-plastic-pollution-may-endanger-brains-69230

- Plastic pollution reduction:
  https://ellenmacarthurfoundation.org/topics/plastics/overview

- The Zero Waste Movement:
  https://www.planetaid.org/blog/what-is-the-zero-waste-movement

New Zealand's perspective

Questions:

- What are the most important issues for human impacts in New Zealand?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Human impacts on the NZ ecosystems
  https://sciencing.com/human-impact-new-zealand-ecosystem-22710.html

- Water pollution in NZ
  https://www.waikato.ac.nz/news-opinion/media/2020/polluted-drained-and-drying-out-new-warnings-on-new-zealands-rivers-and-lakes

- (more to come…)

Social sustainability

Here we look at social processes and how they affect the sustainability of society

Equity and social justice, local and global

Questions:

- What is equity?
- Equity versus Equality, what is the difference between them?
- Why is social justice important for sustainability?
- Why is global social justice essential in tackling global sustainability issues?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Equality versus Equity https://www.marinhhs.org/sites/default/files/boards/general/equality_v._equity_04_05_2021.pdf

- On sustainability and social justice https://www.jus.uio.no/english/research/areas/companies/blog/social-justice-and-sustainability/no-sustainability-without-social-justice.html

- What is Climate Justice? https://350.org.nz/what-is-climate-justice/

- UNESCO the ethical challenges of climate change https://unesdoc.unesco.org/ark:/48223/pf0000370327_eng/PDF/370032eng.pdf.multi.page=1&zoom=auto,-16,850

- Climate Justice Aotearoa http://www.climatejusticeaotearoa.org/

Diversity, Cohesion and Division

Here we look at the social issues that are influencing our ability to solve our sustainability challenges.

Questions:

- Diversity: Why is it essential that we accept and celebrate diversity?
- How can we foster the cohesion we need to solve our sustainability crisis?
- How can we counteract division? Are social media creating or healing divisions?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Social Inclusion in New Zealand
  https://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/research/social-inclusion-in-new-zealand-a-rapid-evidence-review/social-inclusion-in-nz-rapid-evidence-review-report.pdf

- Cultural Diversity in New Zealand Education
  https://nzcurriculum.tki.org.nz/Principles/Cultural-diversity-principle

- Diversity Works NZ
  https://diversityworksnz.org.nz/why-diversity/

- Teens and Social Media
  https://www.newsroom.co.nz/teens-looking-in-the-cracked-mirror-of-social-media

- Social sustainability
  https://www.msd.govt.nz/about-msd-and-our-work/publications-resources/journals-and-magazines/social-policy-journal/spj31/31-social-sustainability-new-zealand-solution-for-tocquevilles-pages22-40.html

Models of Governance

Here we look at systems of governance and what issues may arise with regards to tackling the sustainability crisis

Questions:

- What are the main systems of governance we find around the world today?
- How can a democracy foster sustainability thinking and governance?
- How does our Government in NZ function?
- What big issues lie ahead for our democracy in NZ with regards to sustainability?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Systems of government
  https://www.politicalsciencedegree.com/the-five-most-common-political-systems-around-the-world/

- Democracy and sustainable development
  http://www.fdsd.org/wp-content/uploads/2015/06/The-relationship-between-democracy-and-sustainable-development.pdf

- How does the government work in NZ?
  https://elections.nz/democracy-in-nz/what-is-new-zealands-system-of-government/

Personal sustainability

Here we look at personal sustainability, personal health and well being. Unless we look after ourselves and our own sustainability as a person, we cannot be expected to have a significant impact on wider issues of sustainability.

Personal well-being and human rights

Questions:

- What are the most important aspects of personal sustainability?
- What are the basic human rights?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Sustainability and personal well-being
  https://sustainability.umich.edu/news/connecting-well-being-and-sustainability

- Advancing sustainability through human rights
  https://www.ohchr.org/EN/AboutUs/ManagementPlan/Pages/sustainable-development.aspx

- Sustainable Development and well-being
  https://worldhappiness.report/ed/2020/sustainable-development-and-human-well-being/

- Well being and sustainability, New Zealand
  https://www.motu.nz/our-research/wellbeing-and-macroeconomics/well-being-and-sustainability-measures/

Entitlements and expectations

Questions:

- What are our expectations and entitlements we take for granted?
- Do we need to be prepared to modify and curtail our expectations and entitlements for the benefit of the sustainability of humanity?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- The tyranny of entitlement
  https://orionmagazine.org/article/the-tyranny-of-entitlement/

- Planetary Boundaries
  https://www.stockholmresilience.org/research/planetary-boundaries.html

Economics and sustainability

Here we look at economics and the conflict between economic expectations and sustainability

Capitalism and growth requirements

Questions:

- What is capitalism and do we live in a capitalist society in NZ?
- Does capitalism in its current form require exponential growth?
- Can capitalism be compatible with global sustainability?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- What is capitalism?
  https://www.imf.org/external/pubs/ft/fandd/basics/2_capitalism.htm

- Critique of Capitalism
  https://www.theguardian.com/commentisfree/2019/apr/25/capitalism-economic-system-survival-earth

- Wire, is Capitalism sustainable?
  https://thewire.in/environment/ipcc-warns-that-capitalism-is-unsustainable

Circular economic models

Here we look at alternative economic models that are designed on the cyclical systems of sustainable natural systems.

Questions:

- What are examples of circular economic models?
- What is the Doughnut economic model?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- What is a circular economy?
  https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview

- Doughnut economics
  https://www.kateraworth.com/doughnut/

The future of humanity: Pathways towards a sustainable future

Here we look at the future of humanity from here on.

What could a sustainable society look like?

Questions:

- What are the visions for a sustainable society?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- Visions for sustainable lifestyles
  https://www.cscp.org/wp-content/uploads/2020/09/Policy-Brief_Sustainable-Lifestyles.pdf

- How to start a vision for a sustainable future
  https://www.leading-green.com/2019/12/16/how-to-start-creating-a-sustainablity-vision/

Agenda 21 of the United Nations

Here we explore the Agenda 21, Sustainable Development Framework of the United Nations

Questions:

- What are the United Nations?
- What is the Agenda 21 of the United Nations

Student edited text goes into the box. Take as many pages as you need.

Resources:

- The United Nations
  https://www.un.org/en/

- United Nations Agenda 21
  https://sustainabledevelopment.un.org/outcomedocuments/agenda21

New Zealand's sustainability stance, policies and legislation

Here we look at sustainability policies and legislation for New Zealand

Questions:

- What is New Zealand's contribution to climate change mitigation?
- What are New Zealand's climate change laws and policies?
- What are NZ's pollution policies?

Student edited text goes into the box. Take as many pages as you need.

Resources:

- How does NZ track with regard to climate action? https://climateactiontracker.org/countries/new-zealand/

- NZ climate change contributors by sector https://www.rnz.co.nz/news/national/440352/nz-greenhouse-gas-emissions-agriculture-energy-sectors-biggest-contributors-in-2019

- NZ Zero Carbon Act: https://environment.govt.nz/acts-and-regulations/acts/climate-change-response-amendment-act-2019/

- NZ Climate Change Commission: https://www.climatecommission.govt.nz/

- NZ plastic bag ban: https://environment.govt.nz/what-you-can-do/campaigns/single-use-plastic-bags-banned/

- NZ environmental campaigns: https://environment.govt.nz/what-you-can-do/campaigns/