

3.1.1 — Laws, Policies, and Institutions

TASK Framework: Levers of Opportunity → **Domain:** Governance → **Subject:** 3.1.1 – Laws, Policies, and Institutions

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Definitions: Laws. Transformative change [...] requires the reconfiguration of social practices, social norms, values, and laws that promote unsustainable or discriminatory behavior and choices [GSDR–p.35]. [Similarly,] laws and regulations, taxes and fines are strong signals of the importance society places on certain behaviors. [Government should] strengthen the rule of law, enforce anti-discrimination laws, and address discriminatory social norms to ensure universal and effective access to justice for all groups across countries. Laws that promote unsustainable or discriminatory behavior and choices must be changed. The deprivations that people experience are not only due to lack of technical or financial resources but are often linked to deeply rooted structures of social and political inequality and discriminatory laws and social norms (Global Sustainable Development Report, 2019, 35–41). **Policies.** Policies are the result of debates, dialogue and sometimes struggles and conflicts between different groups of actors [in which] in unequal societies the most influential voices are often those of the rich and powerful. Policies must address hard-to-change behaviors that are damaging to the environment, including economic incentives such as removing harmful subsidies, introducing appropriate taxation, and regulation such as progressive carbon taxation mechanisms. Policies [should] work for the common good, rather than narrow self-interest, across both the public and the private sectors. Policies impeding transformative change should urgently be reversed or modified (Global Sustainable Development Report, 2019). **Institutions.** Effective, transparent, accessible, and inclusive institutions [...] form the cornerstone of governance by goals. Effective institutions must protect the rule of law, [ensure] access to justice, and guarantee a safe and productive space in which civil society organizations can operate. All governments should incorporate targets and indicators into their national plans and budgets, formulate policies and programs to achieve them, and create institutions that deal with uncertainties and risks, as well as systems for monitoring and evaluation (Global Sustainable Development Report, 2019: 30).

<p>Key Ideas</p> <ol style="list-style-type: none"> Principles of good governance Instruments & processes of good governance Justice: Nation-state and international Impediments to good governance Major international human rights frameworks Major global governance institutions Environmental law and policymaking Global partnerships for financing sustainability Problems of global governance Role of state governments in sustainability Multistakeholder and indigenous inclusion 	<p>1. Principles of good governance</p> <ul style="list-style-type: none"> Rule of law, due process, public accountability Access to justice with right of appeal to independent body Transparency and free access to information Representative and inclusive of multiple stakeholders Full and active citizen and civil society participation Safe & productive space in which civil society can operate Ensure governance is diverse, tailored, innovative, adaptive Non-discriminatory: esp., gender, indigenous, generational Effective, transparent, accessible, and inclusive institutions Checks and balances and separation of powers Science-based and evidence-based policymaking 	<p>2. Instruments & processes of good governance</p> <ul style="list-style-type: none"> Fair rules, regulations, and regulatory regimes Elimination of discrimination in laws and norms Policymaking: finance, taxation, regulation Affirmative action laws and quotas Transparent and rigorous budget planning Transparent and mandatory product labelling Governance incorporating targets, indicators and corresponding budgets and policies Policy coherence and strategic planning Realigning existing regulations towards SDG goals Inclusive stakeholders: unions, management, etc. 	<p>3. Justice: Nation-state and international</p> <ul style="list-style-type: none"> Types of justice: retributive, rehabilitative Focus of justice: climate, environmental, trade Object of justice: humans, animals, ecosystems Defense of justice: successes and failures Crime and punishment: national comparisons International criminal court (ICC) International Court of Justice Penitentiary systems and injustice Strengths and weaknesses by country Suspension during a “State of emergency”
<p>4. Impediments to good governance</p> <ul style="list-style-type: none"> Corruption: multiple permissive causes, measurement, impacts, indexes, national comparisons Murder of activists: civil rights, human rights, TU leaders, journalists, environmentalists, whistle-blowers, etc. Illegal weapons trade; mercenaries, private armies Drugs: abuse, trade, dirty/laundared money, organized crime, human health impacts Child labor and exploitation of children Nepotism, cronyism, dynastic rights Discriminatory laws in hiring practices and wages Lack of transparent indicators, data, research, assessment Insufficient funding, training, leadership, and capacity Sectorial and disciplinary silos in policymaking 	<p>5. Major international human rights frameworks</p> <ul style="list-style-type: none"> Universal Declaration of Human Rights (UNDR, 1948) International Convention on the Elimination of All Forms of Racial Discrimination (ICERD, 1966) International Covenant on Civil & Political Rights (ICCPR, 1966) International Covenant on Economic, Social and Cultural Rights (ICESCR, 1966) Convention on the Elimination of All Forms of Discrimination against Women (CEDAW, 1979) Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT, 1984) Convention on the Rights of the Child (CRC, 1989) Corresponding <i>Option Protocols</i> Additional treaties and policies: universal, regional, state 	<p>6. Major global governance institutions</p> <ul style="list-style-type: none"> The United Nations: structure, powers, operations, finance, development programs, environmental programs, SDGs, limitations World Trade Organization (WTO) International Monetary Fund (IMF) International Labor Organization (ILO) World Bank role in sustainability World Health Organization (WHO) Food and Agriculture Organization (FAO) Regional bodies (EU, OAS, ASEAN, Arab League, African Union, etc.) 	<p>7. Environmental law and policymaking</p> <ul style="list-style-type: none"> International treaties and conventions Intergovernmental Panel on Climate Change (IPCC) (COP) Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) (COP) National environmental legislation (more robust) Emerging principles: ecosystem rights, legal personhood (nature, animals, etc.), ecocide, environmental crime, animal rights, ecocentrism Strategies: top-down vs. bottom-up; local vs. centralized; carrot vs. stick; expert vs. inclusive Importance of regenerative leadership, organizations, reinventing organizations (F. Laloux) C40 cities network engaged in green urban policy
<p>8. Global partnerships for financing sustainability</p> <ul style="list-style-type: none"> Decolonizing “developmental assistance” mindsets, structures, processes, policies, outcomes Government/private sector/civil society partnerships Private/public actors: Profit/non-profit actors NGOs and international cooperation Developmental “finance and assistance” Debt and trade policy Financing sustainable development (<i>education, ESD</i>) Knowledge sharing: ITC, science, technology, innovation 	<p>9. Problems of global governance</p> <ul style="list-style-type: none"> Global problems require global solutions...urgently Lack of supranational authority Treaty reporting, compliance, monitoring, enforceability Established principle of national sovereignty (veto power) Dependency on member-state financial contributions Delay in building consensus and taking action Tragedy of the commons / Prisoner's Dilemma Lack of global citizenship Notable potential “exception” of the European Union 	<p>10. Role of state governments in sustainability</p> <ul style="list-style-type: none"> Important role of states, legislatures, and regulatory bodies in transitioning towards sustainability Importance of addressing key issues: polluter pays, environmental litigation, tax havens, tax evasion, and tax optimization; fossil fuel lobby, fossil fuel subsidies, carbon tax, political campaign finance reform, habitat preservation and conservation, resource husbandry, standard setting, monitoring, enforcement, social spending, reform of nutrition and food systems, energy transition and efficiency, infrastructure, planning 	<p>11. Multi-stakeholder and indigenous inclusion</p> <ul style="list-style-type: none"> Public-private partnerships for sustainability Important role of civil society, grassroots and local community, multi-scale politics, trade unions Inclusion of indigenous populations and native govts. Identify and support transformative alliances between traditional and new actors (governments, academia, science, citizens, cities, private sector, etc.) Improving ability to manage hard choices, build coordination & consensus, & channel necessary resources Importance of ability to measure SDG progress

Learning Objectives — Laws, Policies, and Institutions

Knowledge Type	The sustainability literate learner will be able to ...
Definitions <i>Descriptive knowledge</i>	<ol style="list-style-type: none"> 1. Enumerate the key principles, instruments, and processes of good governance that facilitate the transition to a sustainable future 2. List and describe the many impediments society faces in building and sustaining a system of good governance at both national and international levels 3. Describe the various types, focus, and objects of justice—both national and international—and identify the institutions charged with upholding such justice 4. Describe the basic UN-sponsored framework of international human rights treaties and identify the main groups that such treaties are designed to protect 5. Identify the main institutions of global governance charged with addressing sustainability vis-à-vis trade, finance, labor, development, food, health, and human rights 6. Identify the international bodies and programs at the center of the agenda of studying the global environmental crisis and which ones recommend formal policy action to address it 7. Explain the methodologies the UN has established for measuring progress in achieving the SDGs and larger sustainable development agenda by 2030 8. Describe the characteristics of effective global partnerships and multi-stakeholder coalitions in addressing the challenges of sustainability and achieving the SDGs
Current State & Trends <i>Contextualized knowledge</i>	<ol style="list-style-type: none"> 1. List the major policy reform areas within the scope of national governmental authority that would have the greatest and most immediate impact on achieving the SDGs 2. Estimate recent trends in both state corruption and murder of human rights defenders and describe the impact of such negative trends on achieving the SDGs 3. Identify the main strategies designed to fight state corruption and describe the positive impact on the corresponding political and economic system in question 4. Evaluate the impact on the SDG agenda of current policies related to, for example, fossil fuel subsidies, tax “optimization”, and tax evasion 5. Describe the problems associated with traditional official development assistance and identify corrective responses most likely to avoid such neo-colonial problems in the future 6. Explain how “global free markets” often fail to provide the positive outcomes they promise due to incoherent or ill-considered laws, policies, and institutions 7. Describe how the <i>Prisoner's Dilemma</i> and the <i>Tragedy of the Commons</i> apply to the agenda of the SDGs and the struggle to implement a regime of global governance 8. Estimate the effect on the SDG agenda of including more indigenous representatives, native governments, and regenerative leaders into the decision- and policy-making process

Key Resources — Laws, Policies, and Institutions

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SDGs: The 17 Goals, 169 targets, overview, indicators, progress & info. (n.d.). United Nations. Retrieved from <https://sdgs.un.org/goals>

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The Sustainable Development Goals Report – Extended Report – Goal 16 (Peace, Justice, and Strong Institutions). (2022). United Nations. Retrieved from: https://unstats.un.org/sdgs/report/2022/extended-report/Extended-Report_Goal-16.pdf

The Sustainable Development Goals Report – Extended Report – Goal 17 (Partnerships for the Goals). (2022). United Nations. Retrieved from: https://unstats.un.org/sdgs/report/2022/extended-report/Extended-Report_Goal-17.pdf

UNESCO. (n.d.). UNESCO Learning Objectives & Discussion Topics (Full report). Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000247444>

TASK Framework: Levers of Opportunity → **Domain:** Governance → **Subject:** 3.1.2 — Infrastructure, Planning and Natural Resource Management

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Definitions: Infrastructure and planning: The designed set of built equipment, utilities, installations, and services, in addition to their coordinated efforts, that support and promote well-defined societal objectives, such as economic growth, health, and quality of life. **Natural resource management:** "Natural Resource Management refers to the sustainable utilization of major natural resources, such as land, water, air, minerals, forests, fisheries, and wild flora and fauna. Together, these resources provide the ecosystem services that provide better quality to human life" (Krishna & Manickam, 2017, p.23).

Key Ideas		Key International Initiatives	
<ol style="list-style-type: none"> 1. Infrastructure management 2. Circular economy: general terms 3. Green transition planning and management 4. Critical raw materials extraction 5. The case of Lithium 6. Rare earth elements extraction 7. Non-metallic minerals extraction 8. Biomass extraction 9. Addressing fossil fuel extraction 10. Waste generation and management 11. Recycling 12. Reuse 		<ul style="list-style-type: none"> • European Critical Raw Materials Act • World Bank's Global Infrastructure Facility (GIF) • Forest Stewardship Council (FSC) Certification • Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal • United Nations Programme for Environment (UNEP)'s International Resource Panel (IRP) 	
1. Infrastructure management <ul style="list-style-type: none"> • Built Environment: Urban design, energy-efficient buildings, sustainable materials • Critical Infrastructure Systems: Water, energy, transport, waste management • Green vs Grey Infrastructure • Land Use Planning: Urban planning, zoning, transport planning, green spaces • Forest Stewardship: Sustainable forestry, certification systems, community forestry • Ecosystem Restoration: Reforestation, wetland restoration, soil regeneration • Maladaptation: Definition, examples, strategies to avoid 	2 Circular economy: general terms <ul style="list-style-type: none"> • Circular economy • Linear economy • Carbon & Material footprint • Reduce, Reuse, Recycle (RRR) • Resilience and vulnerability • Governing the commons (Ostrom) 	3. Green transition planning and management <ul style="list-style-type: none"> • Strategic planning: Urban planning, energy planning, waste management planning • Adaptive management: definition, principles, applications in resource management • Integrated Management: Co-management of land, water, and other resources • Mitigation of rebound effect • Phasing out obsolete technologies: processes, barriers, case studies • Community-led and inclusive urban planning 	4. Critical raw materials extraction <ul style="list-style-type: none"> • Copper: used in all electronics, peak copper concerns • Cobalt: batteries, jet engines, geopolitics and human rights of Cobalt extraction (e.g., Democratic Republic of Congo) • Uranium: Nuclear energy, weaponry, reserves • Aluminum: Transportation, packaging, construction, high energy requirement for extraction • Extraction Footprint: Land disturbance, biodiversity loss, water and air pollution • Human Health Risks: Occupational hazards, community health impacts (e.g., exposure to heavy metals) • Resource Depletion and Peak Metals: Trends, implications for industry and technology • Recycling opportunities and limitations
5. The case of Lithium <ul style="list-style-type: none"> • Extraction and production • Electrochemical properties • Application: Lithium-ion batteries, portable electronics • Market Dynamics: Rising demand, major producing countries (e.g., Australia, Chile) • Alternatives technologies • Environmental impacts of extraction: water consumption and contamination, land disturbance • Recycling and disposal 	6. Rare earth elements extraction <ul style="list-style-type: none"> • China's dominance • Key Applications: electronics, green tech, defense • Environmental impacts of extraction (novel entities, freshwater, land-system change) • Health impacts: radiation exposure, respiratory issues, groundwater contamination • Low recycling potential (as small components difficult to separate) 	7. Non-metallic minerals extraction <ul style="list-style-type: none"> • Key Minerals: Sand, gravel, limestone, phosphate, potash • Uses: Construction materials, fertilizers, chemical industry, glass, agriculture • Environmental Impacts: Habitat destruction, soil erosion, water pollution, biodiversity loss • Recycling Potential: Low for most minerals, issues with quality and economics • Reserves: Uneven global distribution, issues with availability and access 	8. Biomass extraction <ul style="list-style-type: none"> • Food and crops • Forestry and deforestation • Biofuel Production: First and second-generation biofuels, anaerobic digestion • Rebound Effect: Risks associated with biofuel production • Land use change • Aquatic biomass: overfishing • Sustainable forest management
9. Addressing fossil fuel extraction <ul style="list-style-type: none"> • Energy returned on energy invested (ERoEI) • Peak conventional oil • Unconventional oil & gas • Fracking: Process, environmental and health impacts, regulations • Fossil fuel reserves (coal in particular) and the socio-economic part of the estimation • No recycling/reuse possible 	10. Waste generation and management <ul style="list-style-type: none"> • Waste hierarchy • Waste disposal methods: landfill, incineration, composting • Plastics: production, waste issues, solutions • E-waste management • Waste environmental impacts • Corruption risks • Waste minimization strategies 	11. Recycling <ul style="list-style-type: none"> • Materials recovery processes • Recycling technologies • Recycling rates and trends • Recycling Infrastructure • Downcycling • Irrecoverable materials • Extended Producer Responsibility (EPR) 	12. Reuse <ul style="list-style-type: none"> • Upcycling • Product lifecycle management • Policy and regulatory aspects of reuse • Shared economy, product-service system • Second-hand Markets (and potential rebound effect, of Vinted e.g.) • Repair Services • Regenerative Design

Learning Objectives – Infrastructure, Planning and Natural Resource Management

Knowledge Type	The sustainability literate learner will be able to ...
Definitions <i>Descriptive knowledge</i>	<ol style="list-style-type: none"> 1. Identify how infrastructure, planning and natural resource management help in achieving sustainability 2. Distinguish between prevention, mitigation, and adaptation strategies vis-à-vis climate disaster response 3. Describe the dynamic interactions between ecological footprint, climate change and the Earth carrying capacity 4. Define domestic material consumptions, ecological footprint, and Earth carrying capacity 5. Explain maladaptation and mobilize examples 6. Describe the method of cost-benefit analysis and the related idea of discount rate 7. Define and distinguish reusing from recycling 8. Identify key actors involved for infrastructure, planning, and natural resource management
Current State & Trends <i>Contextualized knowledge</i>	<ol style="list-style-type: none"> 1. Describe past, current, and predictable trends of the sustainability impacts produced by infrastructure, planning and natural resource management 2. Describe past, current, and predictable trends of ecological footprint and material consumption 3. Determine if we overshoot the Earth carrying capacity and its potential consequences 4. Specify the social and geographical disparities of ecological footprint and material consumption 5. Precise the relations between country income and vulnerability to a catastrophe such a global pandemic

Key Resources – Infrastructure, Planning and Natural Resource Management

Circle Economy. (2023). The circularity gap report 2023 (Rep. No. 1-64). Amsterdam: Circle Economy. Retrieved from <https://www.circularity-gap.world/2023>

Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development. (United Nations, New York, 2019). Retrieved from <https://sdgs.un.org/gsdrgsd2019>

IEA. (2022). Global Energy and Climate Model. Paris: IEA. Retrieved from <https://www.iea.org/reports/global-energy-and-climate-model>

IEA. (2022). World Energy Outlook 2022. Paris: IEA. Retrieved from <https://www.iea.org/reports/world-energy-outlook-2022>

IPCC. (2022). Climate Change 2022: Mitigation of Climate Change. Contribution of WG3 to the Sixth Assessment Report of the IPCC. Retrieved from https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf

SDGs: The 17 Goals, 169 targets, overview, indicators, progress & info. (n.d.). United Nations. Retrieved from <https://sdgs.un.org/goals>

World Bank (2017). The Growing Role of Minerals and Metals for a Low Carbon Future. Retrieved from <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/207371500386458722>

World Bank (2018). What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Retrieved from <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/303171545326325241>

3.2.1 — Macroeconomic Considerations and Finance

TASK Framework: Levers of Opportunity → **Domain:** Economy and Finance → **Subject: 3.2.1** — Macroeconomic Considerations and Finance

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Definition: Macroeconomics is a branch of economics that deals with the performance, structure, behavior, and decision-making of an economy. "Economic policy typically encompasses fiscal, monetary and trade policy, while financial flows include flows from public and private sources, within and across national borders." (GSDR, 2019)

Key Ideas

1. Foundational principles and practice
2. Economic growth and GDP
3. Structural employment
4. Ecological limits to green growth and decoupling
5. Socio-economic impacts of market expansion
6. Socio-political impacts of growth: poverty, inequality, and welfare
7. Degrowth, post-growth economies
8. Distribution and redistribution of wealth
9. Environmental economics
10. Conventional sustainable finance and investment
11. Regulating finance
12. Alternative sustainable financial systems

1. Foundational principles and practice

- Prosperity
- Development
- Sustainable development
- Doughnut economics
- Social foundations
- Ecological ceilings
- Social progress index
- Human Development Index (HDI)

2. Economic growth and GDP

- GDP: definition and calculations
- Correlation between GDP and energy consumption
- Limits of GDP (counts only monetary transactions, not volunteer work, quality, what is desirable or harmful, ecosystem services...)
- Growth in time and space
- Sources and drivers of growth
- Growth as ideology and mental infrastructure
- Alternative measurements of economic progress (e.g., Genuine Progress Indicator, Gross National Happiness)

3. Structural employment

- Employment structures and rates
- Sector by sector employment rates
- Structural unemployment
- Employment relation to growth
- Labor structures and wages
- Impacts of growth on employment
- Work as a basic social need

4. Ecological limits to green growth and decoupling

- Decoupling: should be absolute, total, global, permanent
- Pseudo-decoupling failures observed: not all planetary boundaries (only GHG), doesn't count imports, only temporary, very low reduction in GHG emissions, very low economic growth
- Ecological limits to growth: rising energy expenditure, rebound effects, recycling limits, insufficient and inappropriate technological change

5. Socio-economic impacts of market expansion

- Market & non-market spheres of the economy
- Reproductive work
- Process of commoditization
- Social impacts of commoditization
- Growth takes place at the expense of the reproductive non-market sphere; becomes counterproductive beyond a certain threshold
- The Commons

6. Socio-political impacts of growth: poverty, inequality, and welfare

- Growth captured by the wealthiest (national scale)
- Growth in rich countries at the expense of poor countries
- When growth fails to reduce poverty (cf. pre-committed expenditure)
- When growth fails to reduce inequalities: inclusive and exclusive growth
- GDP-happiness decorrelation above a threshold
- GDP-life expectancy decorrelation above a threshold

7. Degrowth, post-growth economics

- Distinction degrowth & recession
- Reducing production, consumption, work
- Reorganizing employment
- Steady-state economy
- Sharing possessions
- Democratic ownership of business
- Participatory budgeting
- Stewardship of nature
- New prosperity and well-being indicators

8. Distribution and redistribution of wealth

- Progressive taxation
- Wealth tax
- Inheritance tax
- Minimum wage and living wage
- Maximum wage
- Carbon tax with redistribution mechanism
- Co-determination, co-partnership, worker participation
- Universal basic services
- Universal basic income
- Universal inheritance

9. Environmental Economics

- Externalities and market failure
- Environmental valuation techniques
- Cost-benefit analysis for environmental policies
- Polluter pays principle
- Cap-and-trade systems and carbon pricing

10. Conventional Sustainable Finance and Investment

- "Green" finance: current state, criticisms
- Environmental, Social, and Governance (ESG) criteria
- Green bonds and climate finance
- Socially Responsible Investment (SRI)
- Impact investing and blended finance
- Fossil fuel divestment movement
- Stranded assets

11. Regulating finance

- Ethical banking and investment
- Public banking
- Climate risk disclosure
- Speculation regulation
- Financial transaction tax

12. Alternative sustainable financial systems

- Crowdfunding, crowdlending
- Microfinance
- Monetary diversity: alternative currencies
- Blockchain and digital currencies
- Sovereign banking and money
- Slow finance
- Community development finance institutions

Learning Objectives – Macroeconomic Considerations and Finance

Knowledge Type	The sustainability literate learner will be able to ...
Definitions <i>Descriptive knowledge</i>	<ol style="list-style-type: none"> 1. Define the principles of economic prosperity, development, and social progress 2. Identify the methodologies and indicators measuring economic prosperity, development and social progress, their roles and limitations 3. Define the principles of sustainability-driven and alternative economic models (i.e., the Doughnut Economics) 4. Describe the structure of employment (i.e., formal / informal) and the concept of decent work 5. Identify the link between Finance and Earth Systems / Human Welfare 6. Identify the macroeconomic implications of transgressing Planetary Boundaries and Social Foundations and transitioning toward sustainability
Current State & Trends <i>Contextualized knowledge</i>	<ol style="list-style-type: none"> 1. Describe past, current, and projected trends of macroeconomic implications of transgressing Planetary Boundaries and Social Foundations (via orders of magnitude) 2. Describe past, current, and projected trends of sustainability driven economic indicators (i.e., Investments in transitioning toward sustainability, development of sustainability-driven employment, via orders of magnitude) 3. Identify geographical and historical disparities of economic prosperity, development, and social progress indicators 4. Identify practical examples of financial systems enabling or hindering the transition toward sustainability

Key Resources – Macroeconomic Considerations and Finance

Financial Stability Board. (2022). Task Force on Climate-related Financial Disclosures: 2022 Status Report. Retrieved from <https://www.fsb-tcfd.org/publications/>

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Polanyi, K. (1944). The Great Transformation: The Political and Economic Origins of Our Time. New York : Rinehart.

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TASK Framework: Levers of Opportunity → **Domain:** Economy and Finance → **Subject:** 3.2.2 – Business, Industry, and Microeconomic Considerations

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Definition: Microeconomics is a branch of mainstream economics that studies the behavior of individuals and organizations in making decisions regarding the allocation of scarce resources and the interactions among these individuals and firms.

Key Ideas

1. Business models for sustainability
2. Sustainable supply chain management
3. Green manufacturing and industrial processes
4. Corporate Social Responsibility (CSR)
5. Social and environmental accounting
6. "Net-zero" businesses and compensation
7. Multistakeholder governance
8. Solidarity economy, cooperatives
9. Consumer behavior
10. Greenwashing and harmful practices
11. Ethical consumerism
12. Resilient economies and communities

1. Business models for sustainability

- Linear vs. circular economy models
- Green marketing and product lifecycle
- Sharing economy and service-based models
- Product-service systems (PSS)
- Cradle-to-cradle design and biomimicry
- Regenerative businesses

2. Sustainable supply chain management

- Life-cycle assessment (LCA)
- Carbon and water footprint in supply chains
- Fair trade and ethical sourcing
- Supply chain transparency and traceability
- Globalization and supply chain risks

3. Green manufacturing and industrial processes

- Industrial ecology and eco-efficiency
- Cleaner production and waste minimization techniques
- Industrial symbiosis and eco-industrial parks
- Energy and resource efficiency in manufacturing
- Environmental Management Systems (EMS)

4. Corporate Social Responsibility (CSR)

- Definition and types of CSR
- CSR reporting standards (GRI, SASB, etc.)
- Stakeholder theory in CSR
- Impact of CSR on brand reputation
- CSR and community development

5. Social and environmental accounting

- Carbon accounting
- Environmental Management Accounting (EMA)
- Non-financial reporting, Integrated Reporting (IR)
- Triple Bottom Line: People, Planet, Profit
- Comprehensive Accounting in Respect of Ecology (CARE accounting)
- Scope 1, 2, 3
- International standards in environmental accounting (ISEA, ISSB...)
- Task Force on Climate Related Financial Disclosures (TCFD)

6. "Net-zero" businesses and carbon offsetting

- Carbon offset/inset/onset (carbon credits)
- Assuring quality and determining value
- Uncertainties about reality and effectiveness
 - Oversight issues (no regulation, standard)
 - Concerns with forestry projects (capture not guaranteed due to premature death, green grabbing...)
 - A clear conscience without reducing GHGs
- Scope of Carbon neutrality: replace "net-zero" with "contribution to collective neutrality"
- Science-based targets
- Net zero emission (NZE) scenarios

7. Multistakeholder governance

- Worker participation, codetermination
- Civil society participation
- Participatory management
- Employee ownership: direct stock ownership, indirect (or trust) ownership, hybrid model
- Workplace democracy
- Works council
- Labor unions' influence on corporate policy

8. Solidarity economy, cooperatives

- Social and Solidarity Economy (SSE)
- Benefit corporation (generic term)
- B Corp (label)
- Definition and principles of cooperatives
- Types of cooperatives
- Cooperative governance and democratic decision-making

9. Consumer behavior

- Understanding consumer behavior: needs, perceptions, motivations
- Manufacturing need
- The purchase decision and its process
- Influence of social, cultural, personal, and psychological factors on consumer behavior
- Role of social media and influencers in consumerism
- Nudge theory, Neuromarketing

10. Greenwashing and other harmful practices

- Definition and types of greenwashing
- Identify greenwashing: red flags and indicators
- Legal consequences and regulations against greenwashing
- Role of third-party certification to combat greenwashing
- Impact washing, SDG washing
- Planned obsolescence
- Fast fashion

11. Ethical consumerism

- Green/ethical consumerism (food, transport...)
- Consumer activism
- Eco-labels and certification schemes
- Factors influencing sustainable consumer behavior
- Consumer willingness to pay for green products
- Role of consumer awareness and education in sustainable consumption

12. Resilient economies and communities

- Local economies
- Community-based solutions
- Ecovillages
- Social entrepreneurship for resilience
- Economic diversification

Learning Objectives – Business, Industry, and Microeconomic Considerations

Knowledge Type	The sustainability literate learner will be able to ...
Definitions <i>Descriptive knowledge</i>	<ol style="list-style-type: none"> 1. Define the concepts of responsible consumption and production and associated business model (i.e., circular economy, symbiotic economy...) 2. Describe the major pitfalls of unsustainable industrialization and in contrast the importance of resilient, inclusive, sustainable infrastructures and industries 3. Identify sustainability-driven and responsible business and management practices (i.e., Corporate Social Responsibility and its associated standards, Stakeholders engagement...) 4. Identify the business models and management practices that are hindering the transition toward sustainability (i.e., Greenwashing)
Current State & Trends <i>Contextualized knowledge</i>	<ol style="list-style-type: none"> 1. Describe past, current, and projected trends of the impact produced by unsustainable business models, industries, or managerial practices (via orders of magnitude) 2. Describe past, current, and projected trends of implementing responsible consumption and production and sustainability driven business models, industries, or managerial practices (via orders of magnitude) 3. Identify geographical and historical disparities of the impact of responsible consumption and production 4. Identify practical examples of business models, industries or managerial practices that are enabling or hindering sustainability

Key Resources – Business, Industry, and Microeconomic Considerations

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3.3.1 – Sustainability Science

TASK Framework: Levers of Opportunity → **Domain:** Science & Technology → **Subject:** 3.3.1 – Sustainability Science

[Click here for User Guidelines](#)

Definition: “An emerging field of research dealing with the interactions between natural and social systems, and with how those interactions affect the challenge of sustainability: meeting the needs of present and future generations while substantially reducing poverty and conserving the planet’s life support system” (Kates, 2011, in Global Sustainable Development Report 2019).

Key Ideas

- | | |
|-----------------------------------|--|
| 1. Science and scientific methods | 6. Climate science |
| 2. Scientific research | 7. Ecology and biology |
| 3. Sustainability theories | 8. Science and society: Science for sustainability |
| 4. The Anthropocene | 9. Science: Misuse and manipulation |
| 5. System Dynamics elements | |

1. Science and scientific methods

- Science: natural sciences, social sciences, and humanities
- Scientific method: criteria and steps
 - Criteria: systematic, objectivity, rigorous and testable, coherent
 - Characterizations (observations, definitions, measurements of the subject of inquiry)
 - Hypotheses, predictions, experiments
- Science education

2. Scientific research

- Inter, intra and transdisciplinary research
- Peer-review process
- Research funding and grant systems
- Publication bias and predatory journals
- Action oriented research
- Industry and research collaboration
- Industry and research collusion
- Citizen science
- Open Science

3. Sustainability theories

- Sustainability with 3 pillars
- Weak and strong sustainability
- Natural capital
- UN's SDG
- Planetary boundaries framework
- Gaia hypothesis/theory
- Social sustainability
- Raworth's Doughnut economics

4. The Anthropocene

- Anthropocene markers
- The Great Acceleration
- Impacts of human activities on Earth systems
- Capitalocene
- Collapsology

5. System Dynamics elements

- Meadows's report, *Limits to Growth*
- Causal loop, feedback loop
- Stock and flow
- Chaos theory, butterfly effect
- Resilience and adaptability of complex systems
- Leverage points in a system
- Systems thinking and modeling
- Transition Management: 3 levels of transitions: landscape, regime, niches (Geels, 2011)
- Societal collapse

6. Climate science

- Paleoclimatology: studying past climates
- Climate systems and feedbacks
- Climate models and predictions
- Tipping points
- Geoengineering
- IPCC functioning
- Net zero emission (NZE) scenarios

7. Ecology and biology

- Biosphere (integrity)
- Biodiversity
- Resilience
- Ecological footprint and biocapacity
- Precautionary and prevention principles
- IPBES functioning

8. Science and society: Science for sustainability

- (Environmental) Ethics
- Science-policy interface
- Scientific consensus
- Public opinion about science
- The role of media in science communication

9. Science: Misuse and manipulation

- Characteristics of science denial (FLICC)
- Conspiracy theories
- Techniques used by science deniers
- Deliberate obfuscation
- Hard / Soft climate change denial
- Pseudoscience
- Denial networks
- Lobbying

Learning Objectives – Sustainability Science

Knowledge Type	The sustainability literate learner will be able to ...
Definitions <i>Descriptive knowledge</i>	<ol style="list-style-type: none"> 1. Explain the meaning of sustainability science and describe the key characteristics of the phenomenon 2. Describe the scientific method and explain its importance within the context of climate change 3. Explain the meaning, purpose, and significance of the Peer Reviewed editorial process 4. Identify the principal NGO, state, and IGO bodies engaged in research and publishing in sustainability 5. Explain the link between science and the implementation of the Sustainable Development Goals 6. Describe the principles and processes of what is called the science-policy interface
Current State & Trends <i>Contextualized knowledge</i>	<ol style="list-style-type: none"> 1. Identify and describe the vested interests and corresponding techniques used—both past and current—to impede climate science 2. Assess to what extent the precautionary principle has been applied, or ignored, in humanity's stewardship of Planet Earth since 1945 3. Describe the scientific techniques and control variables used to measure our proximity to—or transgression of—the nine established Planetary Boundaries 4. Identify and the main sources of funding focused on climate science and describe the general trends in the amounts made available 5. Explain the controversy surrounding the concept of the "Anthropocene Epoch" and highlight arguments from both sides of the debate 6. Describe the role technology and innovation play in climate science

Key Resources – Sustainability Science

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3.3.2 — Technology and Innovation

TASK Framework: Levers of Opportunity → **Domain:** Science and Technology → **Subject:** 3.3.2 Technology & Innovation

[Click here for User Guidelines](#)

Definition: “Technological innovation has long been recognized as crucial to achieving development objectives. Scaling up applications of existing scientific knowledge and technological innovation – in both the natural and social sciences – while pursuing further research, can enable shifts away from business-as-usual actions and address development challenges across many sectors. Often the technology already exists, and the task is to identify and address the obstacles to widespread deployment” (Global Sustainable Development Report, 2019: 36)

Key Ideas <ol style="list-style-type: none"> 1. Sustainable tech: General terms 2. Renewable energy: Types 3. Renewable Energies: Pros and cons 4. Nuclear power 5. Hydrogen technologies 6. Electrification and power storage 7. Transportation transition and electrification 8. Climate engineering 9. Emerging environmental technologies 10. Digital technologies 11. Artificial intelligence 12. Emerging high-tech engineering 			
1. Sustainable tech: General terms <ul style="list-style-type: none"> • Eco-design / eco-conception • Green tech • Biomimicry • Frugal innovation • Low tech: accessible, sustainable, useful • Efficiency • Rebound effect/Jevons' paradox • Path dependence • Innovation & exnovation (phasing out obsolete technologies) • Modularity, compatibility, replicability 	2. Renewable energy: Types <ul style="list-style-type: none"> • Solar power (photovoltaic / concentrated solar power) • Wind power (onshore / offshore) • Hydropower • Bioenergy • Geothermal energy • Solar thermal • Marine energy 	3. Renewable energies: Pros and cons <ul style="list-style-type: none"> • Opportunities <ul style="list-style-type: none"> ◦ Low carbon ◦ Potential for energy independence ◦ Decentralization of power generation • Risks, limits <ul style="list-style-type: none"> ◦ Intermittency, variability ◦ Material footprint, resource intensity ◦ Land use ◦ Biodiversity impact ◦ Energy storage 	4. Nuclear power <ul style="list-style-type: none"> • Technologies (PWR, EPR, SMR...) • Low-carbon and low-material • Nuclear waste issue • Nuclear accidents: causes, human intervention, consequences, controversies • Uranium supply and implications • Nuclear fusion: prospects, benefits (no accident risk, no waste), problems (late deployment)
5. Hydrogen technologies <ul style="list-style-type: none"> • Production of H₂: natural gas reforming, coal gasification, electrolysis • Can replace oil and gas as a storable fuel, potentially low-carbon • Applications in metallurgy (steelmaking, welding) • Fertilizer production (Haber-Bosch process: ammonia production) • Power-to-gas with ENR ; but low efficiency • Produced from fossil fuels (>95%) today • Production would require huge amounts of power 	6. Electrification and power storage <ul style="list-style-type: none"> • Electricity's key role in the energy transition • Modernization and adaptation of electrical networks (smart grid) • Battery issues: storage capacity, service life, environmental impact, resources consumption... • Heavy industry electrification (steel, cement, aluminum...) • Demand-side flexibility • Inertia of energy infrastructures, energy stacking 	7. Transportation transition and electrification <ul style="list-style-type: none"> • Air transport: biofuels, hydrogen • Rail (freight and passenger): electrify the last few • Electric cars <ul style="list-style-type: none"> ◦ Comparison with combustion-powered cars ◦ Resources consumption and recyclability ◦ Re-use of batteries • Electric bikes and scooters • Autonomous vehicles 	8. Climate engineering <ul style="list-style-type: none"> • Carbon Capture and Storage (CCS): post-combustion, pre-combustion capture, oxy-fuel combustion... • Carbon Dioxide Removal (CDR): biochar, direct air capture (DAAC), direct ocean removing • Solar Radiation Management (SRM): marine cloud brightening, mirrors in space, stratospheric aerosol injection
9. Emerging environmental technologies <ul style="list-style-type: none"> • Water tech: desalination • Food tech: Lab-grown meat, vertical farming... • Biodiversity engineering: bee drones, robots... • Waste-to-energy technologies • Nano/biotechnologies for pollution control 	10. Digital technologies <ul style="list-style-type: none"> • Digitalization • Internet & Big data • Social networks • Blockchain • Smart cities • Risk: growing environmental impact 	11. Artificial intelligence <ul style="list-style-type: none"> • AI, Machine learning, Deep learning • Automation • AI in healthcare • AI for climate modeling and prediction • AI for natural resource management • Unemployment risks • Regulation 	12. Emerging high-tech engineering <ul style="list-style-type: none"> • Robotics, drones (risks: military uses) • Biotechnology and biobased materials for Healthcare, Pharmaceuticals, construction ...

Learning Objectives – Technology and Innovation

Knowledge Type	The sustainability literate learner will be able to ...
Definitions <i>Descriptive knowledge</i>	<ol style="list-style-type: none"> 1. Define sustainable technology and innovation in relation to sustainability 2. Determine the conditions enabling a technology and innovation to be sustainable 3. Define sustainability concepts and processes related to technology and innovation such as modularity, redundancy, diversity, rebound effect and transfer of technology 4. Describe and distinguish the concepts of mitigation, carbon dioxide removal and geoengineering 5. Identify the major actors involved in technology and innovation for—or against—sustainability
Current State & Trends <i>Contextualized knowledge</i>	<ol style="list-style-type: none"> 1. Describe past, current, and predictable trends of carbon intensity of products 2. Explain the systemic relation between efficiency progress and increased global energy consumption 3. Identify the risks related to geoengineering technologies 4. Identify the barriers against and the levers for equitable efforts to transfer of technology 5. Precise the relations between technology intensity and recovering from global pandemics 6. Precise the role of carbon dioxide removal to achieve net zero emissions by 2050

Key Resources – Technology and Innovation

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3.4.1 — Transformative Change

TASK Framework: *Levers of Opportunity* → **Domain:** *Individual and Collective Action* → **Subject:** 3.4.1. Transformative Change

[Click here for User Guidelines](#)

Definition: Transformative change (TC) is a fundamental, intentional, system-wide reorganization across political, technological, economic, and social factors, including paradigms and models, social norms and practices, goals and values, and policies and laws. Such change is premised upon harnessing bottom-up technology and innovation, applying indigenous knowledge, engaging grassroots participation across emerging economies, achieving outcomes at scale, and embodying the concept of institutionally sustained results, i.e., consistency of achievement over time that excludes short-term, transitory impact. (IPBES, 2019; UNEP, 2019)

Key Ideas <ol style="list-style-type: none"> 1. Change: characteristics and pathways 2. Insights from theories of change and leadership 3. Framework for <i>Strategic Sustainable Development</i> (FSSD) 4. Target and attributes of sustainable social systems 5. Changing governance approaches to environmental and social action 6. Changing economic and financial interest of fossil fuel industry 7. Changing geopolitical governance structures and practice 8. Changing economics, finance, and resource management 9. Changing approaches to climate justice and social equality 10. Changing high-carbon lifestyles 11. Changing social imaginaries of how we might live sustainably 12. Climate activism for transformational change 			
1. Change: Characteristics and pathways <ul style="list-style-type: none"> • Types. Examples: conformative/reformative/transformative, linear/non-linear, gradual/abrupt, top-down/bottom up, planned/imposed, managed/chaotic, peaceful/violent, rapid/incremental, adaptive/reactive, business-as-usual/paradigm shift • Principles. Examples: tipping points, thresholds, leverage points, forcings, catalysts, stable/non-stable systems, etc. • Motivators. Examples: interest, necessity, desire, anger, fear, greed, error, miscalculation, ideals, values, ethics, etc. • Mechanisms. Examples: laws, taxes, advertising, info, peer pressure, shame/blame, persuasion, threat, protest, boycott, etc. • Agents. Examples: youth, leaders, social/grassroots movements, government, political parties, businesses, unions, educators, activists, mob, etc. • Impediments. Examples: habits, mindsets, values, vested interests, entrenched power, business-as-usual behavior, hedonism theory, poor risk analysis, cognitive biases, etc. 	2. Insights from theories of change and leadership <ul style="list-style-type: none"> • Behavioral change theory. Examples: Social practice theory, Practice theory, Nudge theory, Learning theory, Action research, complexity theory, social and behavioral change communication, behavioral change method, social cognitive theory, positive framing, etc. • Organizational change theory. Examples: Leverage points (Meadows), Iceberg model of change, Two-loop (Wheatly & Frieze), Backcasting and logic models, Panarchy and adaptive cycles, Transition management (Geels), Radical collaboration (Reos Partners), Cynefin, Theory U, social labs, Adaptive Collaborative Management • Leadership theory. Examples: Cynefin framework, Transformative, Charismatic, Ethical, leadership styles, etc. • Persuasion theory. Examples: propaganda, coercion, systemic persuasion, heuristic persuasion, attribution theory, cognitive dissonance theory, social judgement theory, crowd psychology • Role of media and communication. Examples: climate delay, level of urgency communicated, role of external influence, etc. 	3. Framework for <i>Strategic Sustainable Development</i> (FSSD) <ul style="list-style-type: none"> • 3 nature-oriented principles (environmental sustainability) <ul style="list-style-type: none"> ◦ No concentrated extraction of Earth substances ◦ No concentrated of polluting substances produced by society ◦ No degradation of Earth ecosystem and resilience • 5 people-oriented principles (social sustainability) <ul style="list-style-type: none"> ◦ No structural obstacles to human health ◦ No structural obstacles to influence ◦ No structural obstacles to competence ◦ No structural obstacles to impartiality ◦ No structural obstacles to meaning-making • Achieving UN Agenda 2030 <ul style="list-style-type: none"> ◦ Status report for 140+ SDG goals ◦ Up-scaling and acceleration strategies 	4. Targets and attributes of sustainable social systems <ul style="list-style-type: none"> • Basic requirements (Missimer, et al 2017, Broman, 2017)) <ul style="list-style-type: none"> ◦ Trust ◦ Common meaning ◦ Diversity ◦ Capacity for learning ◦ Capacity for self-organization • Attributes <ul style="list-style-type: none"> ◦ Systemic approach to sustainability ◦ Scientific approaches using cross-cultural and reliable knowledge ◦ Principle-based definitions of successful sustainability ◦ SD principles phrased as constraints for iterative design
5. Changing governance approaches to environmental and social action <ul style="list-style-type: none"> • Reform of climate governance and UNFCCC institutional structures <ul style="list-style-type: none"> ◦ E.g., differentiation (between rich and poor); funding and technology transfer (from rich to poor); decision-making that requires consensus; cumbersome nature of negotiation process among 200+ states • Address criticisms of climate modeling (i.e., emphasis on large-scale technological and market-based solutions; based on optimistic projections; encourage delayed emissions-reduction action <ul style="list-style-type: none"> ◦ E.g., reliance on large-scale CDR strategies such as afforestation [AF] and bioenergy with carbon capture & storage [BECCS] ◦ Addressing issues of uncertainty, optimism, reliance on technology • Reform of global order and state system <ul style="list-style-type: none"> ◦ E.g., lobbyists, interest groups, powerful states, strength of leadership of major states, appeals of developing countries; insufficient incentive for action; business-as-usual practices; continued high-carbon growth • Better balance between social and environmental sustainability • <i>Framework for Strategic Sustainable Development</i> (FSSD) (See 11) 	6. Changing economic and financial interests of fossil fuel industry <ul style="list-style-type: none"> • Intentional efforts to discredit climate science • Direct funding of political actors and parties opposed to action • “Think tank” narratives of climate delay (redirect responsibility, push non-transformative solutions, emphasize the downsides, surrender) • “Net zero” pledges of oil companies; promotion of gas as a “transition” fuel • Alliance with petrol States obstructing climate action (e.g., absence of mention of decarbonization in Paris agreement) • Unproven potential of negative emission technologies (NETs) • Need to transition energy system from fossils to renewables 	7. Changing geopolitical governance structures and practice <ul style="list-style-type: none"> • Globalization of the economy since <i>The Great Acceleration</i> <ul style="list-style-type: none"> ◦ Global architecture of exchange, export-led growth, trade liberalization ◦ Reinforced colonial forms of extractivism and waste ◦ Global competition for control of energy and resources ◦ Outsourcing of carbon-intensive production chains • Carbon footprint of global military-industrial complex <ul style="list-style-type: none"> ◦ Environmental impact of war, weapons, nukes ◦ Ideologies of control (over resources, nature, planet, people, etc.) ◦ Relations among/between fossil fuel and nuclear infrastructures • Need for transformation of conflict, conflict resolution, mediation, non-violent communication, conflict styles (cooperative vs. assertive) 	8. Changing economics, finance, and resource management <ul style="list-style-type: none"> • Dominance of neoclassical/neoliberal orthodoxy (i.e., free market, laissez-faire, unregulated markets, equilibrium, rational decision-making, individual agency, utility maximization, optimal resource allocation, expected utility, invisible hand, cost-benefit analysis, instrumental value, capital accumulation, unlimited growth, silence on sources of—or sinks for—energy, materials, and waste, i.e., non-costed externalities); role of ecological economics • “Optimal levels of climate change” (cost of mitigation now vs. cost of loss & damage later, i.e., cost-benefit analysis) • Subsidies both overt and hidden (infrastructure, military technology, big oil, airlines, corporate bailouts, banks, etc.) • Predominance of oligopolistic markets insufficiently sensitive to resource costs, competition, and efficiency • Promotion of emission trading schemes (ETS), carbon markets, carbon tax, carbon offsets, cap-&-trade, cat bonds
9. Changing approaches to climate justice and social equality <ul style="list-style-type: none"> • Is UNFCCC ill-suited to implement climate justice? • Disparity: Who caused the crisis vs. who it impacts • Implementing policy processes for “loss and damage” • Marginalization: Peoples and colonial processes, intersectionality • Empowering indigenous knowledge; diversity, equity, & inclusion • Resilience: meaning, role, development, assessment, social labs • Inequity (both within and across nations) <ul style="list-style-type: none"> ◦ Address the decoupling of the vulnerable from the powerful ◦ Address erosion of social trust required for collective action • Address disagreements over concept of “Loss and damage” • Progress and impediments vis-à-vis SDGs and Agenda 2030 	10. Changing high-carbon lifestyles <ul style="list-style-type: none"> • Status of popular resistance to behavioral change • Role of cognitive shortcuts & biases to avoid change • Disparity of climate actions vs. actual lower emissions • Normalization & trivialization of personal behaviors • Many ongoing highly routinized high-carbon activities remain • Role of policy to coordinate social or material change • Potential impact of social practice theory • Addressing urgency of replacing high-carbon behaviors with new and novel low-carbon practices • Role of participatory & practice-oriented policy processes • Role of addressing the “shifting baseline syndrome” i.e., we accept an already degraded world as a baseline for “progress” 	11. Changing social imaginaries of how we might live sustainably <ul style="list-style-type: none"> • Tension between projected societal futures and role of fossil energy <ul style="list-style-type: none"> ◦ Challenge of escaping carbon lives, endless growth narratives, Petro cultures, carbonscapes, consumerist media & advertising • Role of resource exploitation in future social scenarios & projections <ul style="list-style-type: none"> ◦ Challenge of emancipation from modernist views of carbon use ◦ Scarcity of altered, imagined lives & ways of being w/o fossil fuels • Educational challenge of teaching new ways of thinking: i.e., imagination, visioning, future-casting, and foresight intelligence • Role of critical epistemology (addressing epistemological monocultural thinking; engaging with indigenous ways of being; Earth stewardship, etc.) • Addressing sociopolitical mindsets of industrial modernism: myth of progress, myth of human centrality, myth of our separation from nature 	12. Climate activism for transformational change <ul style="list-style-type: none"> • Precursors. Examples: Wordsworth, Ruskin, Thoreau, Muir, Malthus, Leopold, Carson, Ehrlich, Arthur-Bertrand, Greta, etc. • Causes célèbres. Examples: DDT, nuclear energy, acid rain, ozone depletion, save the whales, animal rights, deforestation, climate justice, fossil fuel divestment climate change, degrowth, new green deal • Methods. Examples: education, protest, strike, boycott, sabotage, framing, demonstration, slow marching, revolt, rebellion, revolution, civil disobedience / disruption, blockade, violent/non-violent action, climate emergency declaration, shame & blame, flygskam, etc. • Grassroots movements. Examples: Luddites, Greenpeace, Animal Liberation Front, Earth Day Network, Extinction Rebellion, Just Stop Oil, etc. • “Radical” activism. Examples: ecocentrism, eco-anarchism, deep green ecology, Gaia theory, eco-feminism, eco-fascism, eco-terrorism

Learning Objectives – Transformative Change

Knowledge Type	The sustainability literate learner will be able to ...
Definitions <i>Descriptive knowledge</i>	<ol style="list-style-type: none"> 1. Describe the characteristics of transformational change with a focus on the qualities that allow for deep and speedy transformation as opposed to other forms of change 2. Identify types, principles, motivators, mechanisms, agents, and impediments to social change and behavioral habits 3. Identify insights originating from main theories of change and/or leadership that help explain how societal transitions take place and which can be applied to provoke or facilitate change 4. Identify and describe key institutional structures and processes that have historically impeded—or have been unable to effect—meaningful climate action (e.g., UNFCCC, fossil fuel industry and lobbies, UN decision-making powers, global financialization, existing energy supply systems, etc.) 5. Articulate how the reality of power, influence, and privilege is situated at the center of society's effort to address the climate crisis, for better and for worse 6. Describe the characteristics, underlying causes (both instructive and permissive) and consequences of high-carbon lifestyles and suggest methods for changing them 7. Explain the role of “social imaginaries” (i.e., collective understandings of how we might live sustainably) in both impeding and proposing transformational change 8. Describe the landscape of popular climate activism—its origins, agenda, methods, and leaders
Current State & Trends <i>Contextualized knowledge</i>	<ol style="list-style-type: none"> 1. Cite historical examples of transformational change that provide inspiration and hope that humans can and will address the Earth crisis with equal effectiveness and urgency 2. Describe the current state and trends in the distribution of power between those seeking to impede climate action and those striving to effect transformational change 3. Assess the progress made to date to address the problems of transgressing Earth boundaries and of falling short of social welfare foundations and characterize such changes as transformational, incremental, or negative 4. Cite examples of alternative modes of community management, new forms of collaboration, innovative ways of governance and political participation, and identify within them the qualities that make transformational change possible 5. Describe situations in local contexts where intra- and inter-personal skills are leading to transformational change towards sustainable development 6. Explain how many of the solutions associated with addressing climate change also provide solutions to problems related to sustainable development and human welfare 7. Characterize progress made to date in increasing the collective cognitive capacity of people to imagine alternative and transformative ways of thinking, being, and doing 8. Given the evolving landscape of popular climate activism, assess its potential for effecting transformational change in those areas most resistant to such change

Key Resources – Transformative Change

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3.4.2 – Cognitive Capacity for Sustainability subject

TASK Framework: Levers of Opportunity → **Domain:** Individual and Collective Action → **Subject:** 1.2.2 – Cognitive Capacity for Sustainable Development

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Definition: “A sustainability competence empowers learners to embody sustainability values, and embrace complex systems, in order to take or request action that restores and maintains ecosystem health and enhances justice, generating visions for sustainable futures.” (GreenComp, 12) Learning for environmental sustainability aims to nurture a sustainability mindset from childhood to adulthood with the understanding that humans are part of and depend on nature. Learners are equipped with knowledge, skills and attitudes that help them become agents of change and contribute individually and collectively to shaping futures within planetary boundaries. (GreenComp, 13) “Understanding how people, as consumers and engaged citizens – make choices and decisions in that regard can help to further motivate [individual] action. Cognitive science, psychology, behavioral economics, neurobiology, and brain research can provide important insight in that regard.” (GSDR 2019, 35)

Key Ideas

- | | | |
|--|---|--|
| 1. ESD competency framework (UNESCO) | 5. Ecopsychology / Environmental psychology | 9. Ecocentrism – Ethics and values |
| 2. GreenComp Framework (EU) | 6. Insights from brain research | 10. Anthropocentrism – Ethics and values |
| 3. 21 st century competency framework (CCR) | 7. Insights from behavioral research | 11. Educating for the Anthropocene |
| 4. Inner Development Goals framework (IDG.org) | 8. Cognitive bias, fallacy, counterfactual thinking | 12. Indigenous knowledge and ways of being |

1. ESD competency framework (UNESCO, 2017)

- Systems thinking
 - Anticipatory competency
 - Normative competency
 - Strategic competency
 - Collaboration competency
 - Critical thinking competency
 - Self-awareness competency
 - Integrated problem-solving competency
- Additional foundational frameworks: OECD; Delphi Study; de Haan (2010); Wals (2015); Wiek (2011, 2016); Glasser and Hirsh (2016); Human needs & satisfier frameworks: A. Maslow, M. Max-Neef, Z. Hassan: Intrapersonal capacities for sustainability

2. GreenComp framework (European Union, 2022)

- Embodying sustainability values
 - Valuing sustainability, supporting fairness, promoting nature
- Embracing complexity in sustainability
 - Systems thinking, critical thinking, problem framing
- Envisioning sustainable futures
 - Futures literacy, adaptability, exploratory thinking
- Acting for sustainability
 - Political agency, collective action, individual initiative

3. 21st Century competency framework

(Center for Curriculum Redesign Report & White Paper)

- Knowledge – What we know and understand:
 - Interdisciplinarity, mathematics, entrepreneurship, global literacy
- Skills – How we use what we know:
 - Creativity, critical thinking, communication, collaboration
- Character – How we behave & engage in the world:
 - Mindfulness, curiosity, courage, resilience, ethics, leadership
- Meta-learning – How we reflect and adapt:
 - Metacognition, growth mindset

4. Inner Development Goals framework (IDG.org)

- Being – Relationship to self (inner compass, integrity and authenticity, openness and learning mindset, self-awareness, presence)
- Thinking – Cognitive skills (critical thinking, complexity awareness, perspective skills, sense-making, long-term orientation and visioning)
- Relating – Caring for others and the world (appreciation, connectedness, humility, empathy and compassion)
- Collaborating – Social Skills (communication skills, co-creation skills, inclusive mid-set and intercultural competence, trust)
- Acting – Enabling change (courage, creativity, optimism, perseverance)

5. Ecocentrism – Ethics and values

- Nature-centered value system (nature over culture)
- Ethical moral equivalence of all life forms
- Intrinsic value of things (vs. instrumental)
- Homo sapiens* as within and part of Nature
- Related ideologies: environmentalism, eco-feminism, biocentrism, left-biocentrism, agrarianism, nature conservationism, deep ecology (Arne Naess), ecophilosophy, veganism, animism
- Related concepts: Gaia theory, biophilia (E. O. Wilson), eco-citizenship, eco-spirituality, green virtue ethic, land ethic (Aldo Leopold)
- Seminal publications: *Walden*, *Silent Spring*, *The Limits to Growth*, *Small is Beautiful*, *Earth Charter*, *Donut Economics*, etc.

6. Anthropocentrism – Ethics and values

- Humanism: Man is the measure of all things
- Human-centric / Speciesism (culture over nature)
- Attributes: modernist, rationalist, capitalist, utilitarian, consumerist, extractivist, hyper-individualist, scientific, intellectual, hyper-mobile, digital, technocratic, secular
- Instrumental value of things (vs. intrinsic)
- Homo sapiens* as outside of and above Nature
- Disenchantment with the world
- Nature-culture dichotomy
- Utilitarian conservationism (Roosevelt)
- Resource management, natural capital, managerial environmentalism
- Tragedy of the commons

7. Educating for the Anthropocene

- Multisensorial experiential education (holistic)
- Nature-based education & early childhood development
- Environmental education: waste awareness, pollution, climate science, resource use
- Wilderness education, survival, and assertiveness
- Farm classes; forest schools; access to wild nature
- Critical ecopedagogy: radical, emancipatory
- Eco-literacy / sustainability literacy
- Curricular reform in line with planetary boundaries
- Overcoming specialization, disciplines, silos
- Overcoming primacy of math, ITC, science over liberal arts
- Identifying the hidden curriculum
- Knowledge of mindsets favorable to sustainability
- Ecological intelligence / Foresight intelligence

8. Indigenous knowledge and ways of being

- Traditional environmental knowledge (TEK), indigenous knowledge (IK), traditional cultural expressions (TCE)
- Ecological intelligence / symbiosis
- Non-timber forest products (NTFPs) / bushcraft
- Wisdom vs. knowledge vs. information
- Sense of place / kinship with place / living in place
- Rituals and natural cycles: e.g., of season, coming of age, practice, medicine, healing
- Reverence for nature / sanctity of nature / reverence
- Caring, nurturing, compassion, love, empathy, wonder
- Sacredness / sacred value / intrinsic value
- Spiritualism / Animism
- Differences between TEK and Western science

9. Ecopsychology / Environmental Psychology

- Synthesis of ecology & psychology for sustainability
- Relationship between human and external world
- Impact on humans of the natural and built environments
- Positive impact of nature on mental health
- Paralyzing effects: eco-anxiety, doomism, solastalgia, eco-grief, collapseology, indifference, nihilism
- Stress reduction theory / Combatting apathy
- Proxemics / Environmental design

10. Insights from brain research

- Evolutionary adaptation and drive towards short-termism; immediate vs. delayed gratification
- Economy of attention span
- Short-term vs. long-term thinking
- Theories of choice, choosing, decision-making
- Judgement & decision-making under risk & uncertainty
- Holistic human development theory (head/heart/hand)
- Limited ability to foresee the future
- Related sub-optimal decision-making

11. Insights from behavioral research

- Behavioral economics: advertising, marketing, sales, environmental factors on behaviors
- Bounded rationality (Herbert Simon)
- Socialization and social mimicry
- Theories of risk and uncertainty / Wicked problems
- Collective behaviors: herd mentality, bubbles, echo-chambers, social tipping points (Gladwell), social influencers, peer pressure, nudge theory, and “boosts”
- Additional individual cognitive limitations

12. Cognitive bias, fallacy, counterfactual thinking

- Types of bias: anchoring, anthropocentric thinking, confirmation, hindsight, projection, framing, outcomes, automation, status quo, optimism, pessimism, over-confidence (vs. judgment accuracy), etc.
- Types of effects: ambiguity (cognitive dissonance), default, bystander, endowment, illusion of control, expertise skepticism, irrational/erroneous threat assessment, etc.
- Fast thinking: intuitive, rule-of-thumb
- Probability weighting

Learning Objectives – Cognitive Capacity for Sustainable Development

Knowledge Type	The sustainability literate learner will be able to ...
Definitions <i>Descriptive knowledge</i>	9. Explain the role human attitudes, values, and identity formation play in shaping individual and collective human decision-making and behavior vis-à-vis sustainability 10. Articulate why cognitive capacity is potentially the most important levers of action and opportunity for implementing sustainability 11. Identify, define, and categorize notable key competencies for sustainable development, argue for their relevance, and propose effective teaching and learning strategies 12. Define and distinguish cognitive capacities for Sustainable Development from other capacities (practical, human, inner, value-based...) and how they are complementary 13. Compare and contrast the ecocentric and anthropocentric mindset and worldview 14. Distinguish key differences in various educational approaches seeking to transmit the key competencies: environmental education, Nature education, Education for Sustainable Development, Transformational Education, Ecopedagogy, (and others)
Current State & Trends <i>Contextualized knowledge</i>	1. Describe past, current, and predictable trends in Education for Sustainable Development, and how cognitive capacities are integrated within it 2. Identify key (local) actors facilitating the implementation of cognitive capacities for Sustainable Development in local context and approach 3. Identify current impediments to reforming educational discourses, pedagogies, and learning outcomes in line with sustainability and planetary boundaries 4. Give examples of (innovative) implementation of approaches seeking to transmit key competencies for Sustainable Development 5. Identify and describe insights and findings from both indigenous science and the behavioral/neural sciences that are pertinent to the agenda of sustainability 6. Describe the techniques and processes that are most effective in bring about both individual attitudinal change and collective social change

Key Resources – Cognitive Capacity for Sustainable Development

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