Detailed Study Guide

Carson's Milieu

Module Introduction:

Carson's Milieu" is the Environment module in the Beaconhouse Notion of Academia, meticulously designed to engage students in the critical challenges of environmental science and sustainability. By blending theoretical knowledge with practical applications, this module offers a comprehensive insight into eco-focused innovations and creative problem-solving. Students are encouraged to think like eco-engineers, applying their understanding of sustainable technologies for survival, mitigation strategies against environmental conditions, and waste management. The module emphasizes critical thinking, decision-making under pressure, and teamwork, mirroring real-world scenarios. It is a dynamic platform for students to explore and express their ideas for a sustainable future, further nurturing their understanding of ecological principles and fostering practical skills in environmental conservation.Delegates are encouraged to think like environmental scientists, policymakers, engineers, and sustainability leaders as they confront issues such as climate instability, resource scarcity, biodiversity loss, and human impact on natural systems.

By incorporating interactive crisis simulations, challenging environmental scenarios, and hands-on prototype development, students can actively engage and unleash their creativity, fostering a deeper understanding of environmental problems and sustainability. This approach not only enhances their critical thinking skills but also makes the learning experience enjoyable and memorable. Additionally, real-time feedback and assessment tools contribute to a more personalized learning journey, allowing students to track their progress and address areas that need improvement.

Round1:

Delegation Cap(3 delegates)

Round Name: Earth Command Simulation

Introduction and Details:

The Earth Command Simulation is a 90-minute immersive crisis management experience where you and your team act as the Environmental Command Council in response to a planetary emergency. You will analyse real environmental indicators, design science-based intervention models, build an interactive evidence board, and respond to unplanned crisis waves that disrupt global systems. Every decision has consequences, and you must adapt, reallocate resources, and communicate your strategy clearly. The simulation mirrors real global environmental emergencies and demands creative yet practical leadership.

Expected Outcomes:

By the end of this round, you should be able to demonstrate a strong understanding of complex environmental systems and the interconnections between energy, ecosystems, infrastructure, and food and water security. You will showcase your ability to analyse indicators, make adaptive decisions under pressure, and communicate your strategy with clarity and scientific grounding.

Significance Within the Module:

This round sits at the core of the Carson's Milieu Environment Module. It builds directly on the module's themes of sustainability, crisis response, systems thinking, and collaborative problem-solving. Delegates will apply theoretical knowledge in an active scenario that simulates the urgent, interconnected problems facing the real Earth system today. Success in this round reflects deep engagement with environmental science concepts and an ability to lead under uncertainty.

Round Flow:

Phase 1 (Introduction and Briefing):

First, you will receive a briefing on the planetary emergency, including key indicators. Your team will select one specialised department: Energy Command, Biosphere Recovery, Infrastructure Stabilisation, or Global Food & Water Security. You will then learn how your evidence board should be structured and what outputs are expected.

Phase 2 (Main Design and Board Building):

Next, your team will analyse your department's environment indicators and identify urgent risks.

Energy Command: Responsible for ensuring stable, renewable, and resilient global energy systems, preventing grid failure, and securing essential power supply.

Environmental indicators might include:

- Global renewable energy capacity

-Fossil fuel dependence

- Regions facing blackouts

- Grid instability

- Solar and wind potential

Possible challenges:

- Over-reliance on unstable fossil grids

- Blackouts in heatwave regions

- Lack of storage systems

- Slow adoption of renewables

Biosphere Recovery: Focused on restoring ecosystems, protecting biodiversity, and rebuilding natural habitats and carbon sinks.

Environmental indicators might include:

- Deforestation

- Species extinction risk

- Habitat fragmentation

- Carbon sink depletion

- Wetland loss

Possible challenges:

- Pollinator species collapse

- Soil erosion

- Forest fragmentation

- Disconnected ecosystems

<u>Infrastructure Stabilisation:</u> Ensures cities and communities stay functional by strengthening buildings, transport networks, and climate-resilient protections.

Environmental indicators might include:

- Coastal flood-risk

- Heatwave-affected regions

- Dam and bridge vulnerability

- Urban density and hazard exposure

- Storm-surge projections

<u>Possible challenges:</u>

- Flood-prone coastlines and unprotected low-lying cities

- Heat-vulnerable buildings without cooling or insulation

- Transport routes damaged by extreme weather

- Weak emergency shelters and resilience hubs

<u>Global Food & Water Security:</u> Works to secure reliable access to safe water and food by improving agriculture, managing drought, and stabilising supply systems.

Environmental indicators might include:

– Crop yield declines

– Global drought

– Groundwater depletion

– Food waste

– Malnutrition

Possible challenges:

– Droughts reducing crop yields and water availability

– Soil degradation weakening long-term food production

– Broken or unreliable food distribution routes

– Limited or unsafe clean water sources in many regions

You will define clear goals and design an evidence board with a science-based model. You will build a Live Evidence Board, which includes:

Intervention Zones (where models are placed)

Resource Flow (use materials to show resources moving through systems, with explanations of your model too)

Decision Log Sheets (to record your choices and justifications).

This phase tests your analytical reasoning, systems thinking, creativity, clarity in visual communication, and teamwork.

Phase 3 (Crisis Wave):

Suddenly, a disruption occurs, leading to communication systems failing, satellites collapsing, data sharing breaking down, and supply chains stalling.

Depending on your department:

Energy Command may need to decentralise power.

Biosphere Recovery may need autonomous restoration zones.

Infrastructure Stabilisation must strengthen community resilience.

Food & Water Security must localise distribution networks.

Your team must identify what failed, adapt your board, change resource flows, and record changes in decisions based on scientific principles. Judges will be looking for adaptive reasoning, rapid problem-solving, leadership, and clear documentation of why your choices make sense.

Phase 4 (Final Mission Briefing);

In the final minutes, your team will give a two-minute briefing summarising your strategy, intervention model, crisis impacts, adaptations, and why your system is resilient. Your Decision Log Sheet documenting your evolving strategy must be submitted.

Skills and Qualities Judges Are Looking For:

1. Scientific reasoning that is accurate and realistic

2. Adaptability and thoughtful decisions in response to a crisis

3. Clarity of visual communication on your board

4. Strong teamwork, coordination, and task delegation

5. Confidence and precision in your mission briefing

They will value solutions that are not just creative but grounded in basic environmental science principles, such as renewable energy systems, ecosystem recovery, resilient infrastructure, and food and water resource management.

Logistics:

Rulers 30 cm

Scissors

Glue stick

Liquid glue

Large transparent tape

Black and red permanent markers

Erasers + pencils

Small sticky notes 3 colours

Cardboard sheets for model structures

Coloured construction paper)

Coloured strings 4 colours

Push pins

Craft wires

Small wooden sticks/popsicle sticks

Toothpicks

Coloured pipe cleaners

Coloured markers

Lined pages for decision logging

Percentage of Delegates Eliminated After This Round:

After this round, approximately 40-50 % of participating delegates will be eliminated as the competition progresses

Study resources

Essential reading links:

Planetary Boundaries & Earth System Science

https://www.stockholmresilience.org/research/planetary-boundaries

A scientific overview of the planetary boundaries framework showing the Earth processes that sustain stability and the risks when they are pushed beyond safe limits.

Food Systems and the Environment

https://www.genevaenvironmentnetwork.org/resources/updates/food-systems-and-the-environment/

Explains how food production and consumption are linked to environmental health, climate impacts, and sustainability challenges.

What Is Renewable Energy? (UN Resource)

https://www.un.org/en/climatechange/what-is-renewable-energy

A reliable explanation of renewable energy sources, how they differ from fossil fuels, and why they matter for sustainable environmental systems.

Climate Change, Water & Food Security (FAO PDF)

https://www.fao.org/4/i2096e/i2096e.pdf

A comprehensive look at how climate change affects water availability and food production systems

Renewable Energy in the Water-Energy-Food Nexus (IRENA PDF)

https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_Water_Energy_Food_Nexus_2015.pdf

Shows how renewable energy systems interact with water and food sectors, helping you think in integrated systems.

YouTube links:

Scientific Overview: Planetary Boundaries Explained

https://www.youtube.com/watch?v=0UYHxO0PQw4

An engaging explanation of Earth's environmental limits and why studying them matters.

Renewable Energy Basics - National Geographic

https://www.youtube.com/watch?v=1kUE0BZtTRc

Explains core renewable energy concepts, helpful when designing Energy Command solutions.

Ecosystem and Biodiversity Restoration

https://www.youtube.com/watch?v=XhjN8Xux2I4

Shows real-world ecosystem restoration strategies that can inspire Biosphere Recovery interventions.

Topics to study:

1. Planetary Boundaries & System Limits: Understand the Earth's major life-support processes, their safe limits, and what happens when they are breached.

2. Water–Energy–Food Nexus: Recognise how water, energy, and food systems are connected and influence each other.
3. Renewable and Sustainable Energy Basics: Know what renewable energy is, why it matters, and how different types (solar, wind, hydro, geothermal) work.
4. Food System Sustainability Challenges: Learn why modern agriculture affects ecosystems and water supplies, and what sustainability means in that context.
5. Climate Adaptation Strategies: Get familiar with basic adaptation concepts for communities and infrastructure under changing environmental stressors.

Skills to master:

Focus on building these practical and cognitive skills:

1. Systems thinking: being able to trace how changes in one part of a system affect other parts.

2. Collaborative communication: explaining ideas clearly with teammates and on the evidence board.

3. Adaptive reasoning: thinking on your feet when unexpected crisis events occur.

4. Visual modelling: making complex ideas easy to understand visually.

5. Scientific grounding: using evidence, not guesswork, to justify decisions.

Round 2: *Saving the Fields*
Delegation Cap(3 delegates)

Round Name: Saving the Fields (Round 2)

Overview & Significance

This round introduces delegates to a complex challenge situated within the agricultural sector. Delegates will be required to respond to a developing situation that has implications beyond a single stakeholder or outcome.

The purpose of this round is to evaluate how delegates approach **uncertain, evolving problems** where information may be incomplete and outcomes are interconnected. The

scenario reflects real world situations in which decisions must be made despite ambiguity, competing priorities, and external pressure.

This round is significant within the module because it shifts focus from understanding problems to **responding to them responsibly**.

Round Flow

Phase 1: Initial Briefing

At the start of the round, delegates will be introduced to a situation that requires immediate attention. The information provided will outline the context and highlight why the issue matters.

Your role at this stage is to:

- Understand the situation as presented
- Identify the broader implications
- Recognize that the problem involves multiple interests

No prior technical knowledge is required.

Phase 2: Decision-Making

You will be expected to make and justify a set of decisions in response to the situation. Multiple responses may be possible, each carrying different implications.

At this stage, you should focus on:

- Logical reasoning
- Awareness of trade-offs
- Coherent justification of choices

The round does not reward extreme or idealistic solutions; it rewards **considered judgment**.

Phase 3: Practical Considerations

Delegates will need to reflect on how decisions translate into real world outcomes. This includes considering people, systems, and limitations that may affect implementation.

You are encouraged to think about:

- Accessibility and feasibility
- Communication and understanding
- Consequences beyond immediate outcomes
- Budget

This phase emphasizes realism over theory.

Phase 4: Reflection & Outlook

Toward the later part of the round, delegates may be asked to reflect on broader implications or future considerations connected to the scenario.

This phase assesses:

- Long-term thinking
- Awareness of sustainability and responsibility
- Ability to look beyond short term resolution

Evaluation-General Focus

Specific marking schemes will not be shared in advance.

In general, delegates will be assessed on:

- Clarity of thought
- Ability to reason under uncertainty
- Justification of decisions
- Balance between urgency and responsibility
- Team communication

Elimination

Only 10 delegations will advance beyond this round.
Delegates should treat this as a **decisive stage** in the module.

Preparation & Study Resource Hub

- **Crisis management report**

https://www.britannica.com/topic/crisis-management-government/Making-critical-decisions

- **Example report on rice production (Bangladesh)**

https://www.researchgate.net/publication/393097414_A_REVIEW_OF_RICE_PRODUCTION_RISK_IN_AGRICULTURE_OF_BANGLADESH_PERSPECTIVE_PEST_AND_DISEASES

- **Pesticides and invertebrates**

- **Analysis of land suitability** (Southern Punjab, Land conditions e.g Multan)

Skills That May Be Useful

- Structured thinking
- Clear communication
- Team coordination

Final Note to Delegates

This round is designed to test **how you think, not what you know**.

Expect ambiguity.
Adapt accordingly.

Round 3

Delegation Cap(3 delegates)

Round Name: Eco Engineers Challenge

Introduction& Details:

The Eco Engineers Challenge (Round 3) is a practical, systems-based round that assesses delegates' ability to design, build, and demonstrate a **sustainable system** using mainly waste and discarded materials. Teams work within real-world constraints such as limited time, resources, and changing market conditions through a marketplace simulation. Rather than producing a static model, delegates must apply systems thinking by clearly showing inputs, processes, and outputs within themes such as clean energy from waste, water conservation, urban biodiversity, or pollution reduction. The expected outcome is a prototype that can be tested, explained, and justified in terms of environmental impact, material use, and feasibility.

This round is significant to the module because it reflects how environmental and sustainability challenges are addressed in real engineering and design contexts. It strengthens core skills in systems thinking, engineering logic, and sustainable design, while reinforcing key concepts such

as circular economy, resource efficiency, and adaptability under constraints. By combining technical problem-solving with teamwork, communication, and strategic decision-making, the round effectively bridges theory and practice and prepares delegates to approach complex environmental problems with realistic, solution-oriented thinking.

The goal of this challenge is to showcase the principles of sustainability and the circular economy, where the focus is on reusing, repurposing, and reducing waste and producing a sustainable system that addresses the problems of Air and water pollution, bio diversity loss and limited energy resources. Teams will be evaluated based on how well their products meet these goals, as well as their creativity, design innovation, and practicality in real-world applications.

Possible Themes will be:

- Clean energy from waste
- Water Conservation and Filtration
- Urban Biodiversity and Habitat Support
- Pollution Reduction Systems

Delegates will be provided with a starter kit of waste and discarded materials along with basic tools to construct a **functional sustainable system** for this round. Each team will also receive a limited number of Resource Credit tokens, which can be used to purchase additional materials from a central Sustainability Supply Depot (marketplace). Since items in the marketplace vary in price and availability, delegates must make careful, evidence-based decisions about resource allocation and system feasibility.

Teams will have approximately **75 minutes** to plan, design, build, test, and refine their system. The marketplace will open every 10 mins for 5 minutes during the build phase, with events such as price inflation, limited-stock items, or flash auctions requiring teams to adapt their designs in real time. At the end of the round, teams will present and demonstrate their working system to the judges. Systems will be evaluated based on innovation, functionality and engineering logic, effective upcycling of materials, environmental impact, build quality, and the team's ability to clearly explain how their system operates and contributes to sustainability.

Round Flow:

Phase I: Introduction and Setup (15 minutes)

Delegates are given an overview of the round and briefed on the provided resources and the central marketplace. Teams will spin a wheel to receive a randomly assigned theme for their upcycled product, adding an element of surprise and fostering creativity.

Phase II: Prototype Making (75 minutes)

Teams will have 75 minutes to conceptualize, design, and create their product. They will start by brainstorming and sketching their idea, followed by the physical construction of their product using the provided waste materials and tools.

After every 10 minutes, the marketplace will open for a brief moment of 5 minutes during which delegates can purchase additional materials using their tokens.

Phase III: Presentation (2-3 minutes per team)

After the construction period has elapsed, teams will present their upcycled products to the judges. While presenting, they will explain the design, functionality, and environmental benefits of their product. The judges will evaluate their product based on creativity, functionality, aesthetic appeal, and sustainability.

Round-Specific Instructions for Delegates:

1. Material Utilization: Delegates must be mindful of the materials they use as their goal is to creatively repurpose waste and minimize the need for extra resources.

2. Marketplace Purchases: Delegates will have tokens that they can spend to purchase extra materials from the central marketplace. However, some materials may be more expensive than others so delegates must choose wisely about spending them.

3. Time Management: Delegates have 75 minutes to design and create their product. They are encouraged to use their time efficiently by planning their design first and dividing tasks among team members.

4. Team Roles: Delegates must ensure that each team member contributes to the development of the prototype as they will be marked on their teamwork and collaborative skills.

5. Presentation: In their 2-3 minute presentation, delegates are expected to explain the inspiration behind their product, describe how they built it, and outline its environmental benefits.

Judges will assess teams on how effectively their system works, how logically and clearly it is designed, and how well it addresses a real environmental problem. Strong teams demonstrate originality while keeping their system realistic and functional, make thoughtful use of waste materials, and show clear environmental benefit. Judges also look for adaptability when plans change, evidence of problem-solving during construction, and strong teamwork. Clear communication is critical: delegates should be able to confidently explain what problem they are solving, how their system operates, why specific materials were chosen, and how the system could be improved or scaled in real-world conditions.

Topics to Study

- Renewable energy: Know what renewable energy is, why it matters, and how different types (solar, wind, hydro, geothermal) work.

  - Water conservation and purification: why are water resources depleting, what necessary steps can be taken to conserve, purify water.
  - Bio diversity loss and prevention: how urbanization and other factors impacts biodiversity how to prevent/ reduce it
  - Airpollution: major contributors of airpollution, how to reduce it.
  - Urbanization and its effects
  - Green corridors

Skills Tested:

- Creativity and Innovation
- Problem-solving
- Teamwork and Collaboration
- Research and Knowledge
- Analytical Skills

- Adaptability
- Time Management

Tips for Success:

1. Research all domains thoroughly
2. Maintain strong team coordination
3. Manage time efficiently
4. Balance Creativity with Practicality
5. Think Innovatively

Logistics provided

1. Pens
2. Scissors
3. UHU
4. Tape
5. Ruler (6 inches)
6. Paper cutter
7. Glue sticks
8. Colorful markers
9. 1L Plastic bottles x3-4
10. Plastic bottle caps
11. Cardboard cutouts
12. Plastic food containers with lids
13. aluminum cans x2
14. Old CDs / plastic discs x3
15. Fabric strips / old clothing pieces
16. Sand
17. Gravel / small stones
18. Charcoal
19. Iron nails
20. Newspaper
21. Thermacoal sheets(x1)
22. Acrylic paints and brush
23. Popsicle sticks
24. Colorful straws
25. Permanent black markers
26. Rubber bands
27. Paper clips
28. Butter paper
29. Colourful clay
30. Toothpicks

31. Colorful Pipe cleaners
32. Copper Wire

Essential Reading Links:

1. https://www.nrdc.org/stories/water-pollution-everything-you-need-know
   https://cameto.com/en/news/what-is-a-water-purification-system/
2. https://www.britannica.com/science/air-pollution
3. https://www.stateofglobalair.org/pollution-sources
4. https://instituteofsustainabilitystudies.com/insights/lexicon/reviving-urban-biodiversity-how-cities-can-drive-nature-conservation/
5. https://rdmc.nottingham.ac.uk/bitstream/handle/internal/112/Engineering%20Sustailability/26_sustainable_energy_systems__renewable_energy.html
6. https://www.nationalgrid.com/stories/energy-explained/how-does-solar-power-work
7. https://www.c40knowledgehub.org/s/article/How-to-enhance-restore-and-protect-biodiversity-in-your-city
8. https://link.springer.com/article/10.1007/s11269-023-03723-6?utm_source=chatgpt.com

Helpful resources/ youtube links:

https://cameto.com/en/news/what-is-a-water-purification-system/

https://www.youtube.com/watch?v=4O7FMt9GaP0

https://www.youtube.com/watch?v=Gg0Ur43kGN0

https://www.youtube.com/watch?v=wrKcb2EmlAw

https://www.youtube.com/watch?v=but5ntRMQQc

https://www.futureenergysystems.ca/public/download/files/276574?utm