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Workshop Template – Modular Steel in the Circular Economy

Interreg Italia–Österreich

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DOCUMENT APPROVAL

Name	Organization	Role	Action	Date
Alexander Berndt	CUAS	Lead		

DOCUMENT HISTORY

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V1.2			
V1.3			
V1.4			

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1. Introduction

The “Modular Steel in the Circular Economy” workshop is designed for students who are interested in sustainability, circular economy, and hands-on eco-design. The workshop focuses on building and reconfiguring modular steel structures using the Eitech construction kit, while exploring the concepts of Life Cycle Assessment (LCA) and the Circular Economy (CE).

Through this process, participants will discover how Design for Disassembly (DFD) enables reuse, how circular design reduces environmental impacts, and why reuse is often more sustainable than recycling in keeping materials like steel in circulation.

1.1 Learning Objectives

By the end of the workshop, participants will be able to:

- Learn the principles of the Circular Economy (CE) and its role in the steel industry.
- Gain hands-on experience by constructing a crane and transforming it into a bridge using modular parts.
- Evaluate the environmental impact of steel structures through the 5 stages of Life Cycle Assessment (LCA).
- Reflect on how modular steel design can contribute to sustainable cities, infrastructure, and industries

1.2 Required Knowledge

No specialized background is required. However, participants will benefit from an awareness of environmental issues such as climate change, waste generation, energy use, and resource depletion.

The workshop is designed to be accessible, practical, and engaging. It is suitable for students aged 15–18, encouraging teamwork, problem-solving, and innovation in sustainable engineering.

2. Workshop Structure

Table 1 Workshop Structure

Phase	Duration	Activities	Purpose	Materials
Opening	10 min	Welcome participants, Introducing workshop themes	Engage curiosity, set sustainability theme	Slides
Context Setting	TBD	Mini talk: Circular Economy & LCA introduction steel examples	Explain key concepts and link to activity.	Slides
Main Content	TBD	Hands-on activity: Build crane → disassemble → rebuild as bridge; Calculate Reuse %; Reflect on LCA; Prepare poster	Apply CE and LCA in product creation.	Slides Material required for hands on activity
Wrap-up	15 min	Team presentations & awards, feedback & closing.	Consolidate learning, celebrate achievements, gather feedback.	Certificates, feedback forms.

2.1 Workshop Agenda

Table 2 Workshop Agenda

Phase	Duration	Activities	Purpose	Materials
Opening	10 min	Welcome participants, introduce theme, icebreaker quiz "What happens to steel after 50 years?"	Engage curiosity, spark discussion	Slides
Context Setting – Circular Economy (CE)	TBD	Mini talk on Linear and Circular Economy.	Build understanding of CE principles.	Slides
Context Setting – Life Cycle Assessment (LCA)	TBD	Introduction to 5-stage LCA using Traditional vs Circular steel case study.	Show how LCA measures environmental impacts across life stages.	Slides
Hands-On Build (Phase 1)	TBD	Teams build cranes with Eitech kit (bolted, modular).	Apply CE by practicing modular construction	Eitech kits
CE Twist: Client Change	TBD	Project changes: cranes must become lifting bridges. Teams disassemble and count reusable parts.	Experience Design for Disassembly; calculate Reuse %	Eitech kits
Hands-On Build (Phase 2)	TBD	Rebuild crane parts into lifting bridge.	Practice reuse in design	Eitech kits
LCA mapping	TBD	Teams think about LCA mapping; identify stages skipped by reuse.	Apply LCA thinking to real products	Work sheets
Poster Preparation	TBD	Teams prepare posters showing results, Reuse %, LCA insights, and innovative ideas.	Synthesize learning visually	Poster paper, stationary items
Team Presentations	TBD	Groups present builds, LCA findings, Reuse %, improvement ideas.	Peer learning, public speaking	Posters
Review & Awards	TBD	Best build, CE innovation, LCA insight, and teamwork.	Celebrate achievement, encourage collaboration.	Certificates, small prizes.
Feedback & Wrap-Up	TBD	Reflection worksheets, group discussion, closing remarks.	Consolidate learning, gather improvement ideas, close the session.	Feedback forms

2.2 Required Equipment

Table 3 Required Equipment

Category	Item	Quantity	Purpose	Alternative Options
Technology	Projector & screen	1 set	Present slides and visuals	Large monitor, flip charts
	Laptop	1 unit	Run presentation and visuals	Tablet with HDMI adapter, shared desktop
	Speakers	1 set	Audio for videos or sound-supported content	Built-in laptop speakers, no-audio option
Materials	Eitech Kit	1 per team	Kit for hands-on activity	NA
Supplies	Markers, pens, pencils, erasers	1 set/team	Poster design, calculations, sketching, note-taking	N/A
	Scissors, glue, tape	1 set/team	Assembly of posters and model elements	N/A
	Poster paper	2 sheets/team	Visual presentation of team decisions, CE & LCA strategy	A3/A2 papers
Documentation	LCA reflection sheets	1 per participant	Recording environmental impact analysis	Digital form (Google Sheets/Forms)
	Evaluation sheets	1 per team	Peer review & judging of final products	Tablet, online survey
Other	Full Slide Deck	1 master set (digital)	Guide participants through the entire workshop visually and clearly	Available via shared drive, USB stick, or printout handouts

2.3 Evaluation Framework

Table 4 Workshop Evaluation

Evaluation Type	Timing	Method	Key Metrics	Follow-up Actions
Immediate	End of workshop	Feedback forms	Satisfaction, objective achievement	Immediate improvements
Short-term	1-2 weeks later	Email survey	Knowledge retention, initial application	Provide additional resources
Long-term	3-6 months later	Interview/survey	Behaviour change, performance impact	Plan follow-up sessions

3. Detailed Explanation

3. Workshop Layout Explanation

3.1. Opening

Activity: Welcome & Icebreaker Quiz

Description:

The facilitator will welcome all participants and provide a brief overview of the day's structure. The session will begin with a short, engaging icebreaker quiz to introduce the central theme of the workshop.

The facilitator welcomes participants and explains the workshop goals. Students take part in a short quiz: “What happens to steel after 50 years?” (options: landfill, melt/recycle, reuse). This leads into the theme of how the Circular Economy (CE) challenges us to keep steel in use for as long as possible.

Purpose: To create an engaging start, spark curiosity, create a positive atmosphere, and introduce sustainability concepts in a relatable way.

Materials: Slides

3.2. Context Setting – Circular Economy (CE)

Activity: Mini talk on Linear vs Circular Economy

Description:

The facilitator will present the Circular Economy model, explaining how it differs from the traditional Linear Economy (take-make-dispose).

Purpose: Build foundational understanding of CE principles in a relatable way.

Materials: Slides

3.3. Context Setting – Life Cycle Assessment (LCA)

Activity: Introduction to 5-Stage LCA with case study.

Description:

Students learn that Life Cycle Assessment (LCA) measures environmental impacts across the entire life of a product or building. The facilitator explains the 5 stages—Raw Materials, Processing, Manufacturing, Use, End-of-Life—using the example of steel. Traditional (recycling/welding) vs. Circular (reuse/modular) pathways are compared.

Purpose: Show how LCA reveals hidden impacts and connects directly to CE solutions.

Materials: Slides, LCA charts.

3.4. Hands-On Build (Phase 1)

Activity: Build the crane.

Description:

Teams assemble a crane model using the Eitech kit. The focus is on using bolts and nuts rather than bending or welding-like connections, simulating modular construction. Students are encouraged to think about Design for Disassembly while building.

Purpose: Apply CE thinking by practicing modular, reusable construction.

Materials: Eitech kits, slides

3.5. CE Twist: Client Change Request

Activity: Disassembly and part recovery.

Description:

The facilitator announces a “client change”: instead of a crane, the client now requires a lifting bridge. Teams must disassemble their crane and count how many components are reusable vs. damaged. Students calculate their Reuse % using the provided formula.

Purpose: Experience Design for Disassembly in practice, measuring recoverability, and connecting reuse to CE principles.

Materials: Eitech kits, slides

3.6. Hands-On Build (Phase 2)

Activity: Rebuild as a bridge.

Description:

Teams rebuild their models into a lifting bridge using the recovered crane components. Any additional parts required must be recorded. Students compare how easy or difficult it was to reuse the crane components in a new structure.

Purpose: Practice reuse in design and highlight the impact of modular construction.

Materials: Eitech kits, slides

3.7. LCA Mapping & Reflection

Activity: Map results onto the 5 LCA stages.

Description:

Teams complete an LCA worksheet showing which life cycle stages are skipped or reduced through reuse (e.g., no new mining, no smelting). Students reflect on the environmental savings achieved through modularity.

Purpose: Connect practical activity with theoretical LCA framework.

Materials: Worksheets

3.8. Poster Preparation

Activity: Teams create posters.

Description:

Each group prepares a poster summarizing their results: crane & bridge sketches/photos, reuse %, LCA insights, and one innovative idea for making steel more circular. Posters are designed for use in team presentations.

Purpose: Synthesize learning and prepare for sharing.

Materials: Poster paper, stationery

3.9. Team Presentations

Activity: Present posters to peers.

Description:

Each team presents their crane-to-bridge transformation, reuse % achieved, and the LCA stages they skipped. They also pitch their innovation idea for better circular steel design. Other teams can ask questions.

Purpose: Promote peer learning, build communication skills, and share CE solutions.

Materials: Posters, slides

3.10. Review & Awards

Activity: Recognize team efforts.

Description:

The facilitator awards certificates or small prizes for categories such as: Best Build, Highest Reuse %, Best LCA Insight, and Most Innovative Idea.

Purpose: Motivate participants, celebrate teamwork and creativity.

Materials: Certificates, small awards.

3.11. Feedback & Wrap-Up

Activity: Reflection worksheets, group discussion, closing remarks.

Description:

Students fill out feedback forms and join a group reflection: “How can steel be made more circular in your community?” The facilitator summarizes the day’s key messages: reuse saves energy, modularity enables flexibility, and CE keeps materials in circulation.

Purpose: Consolidate learning, inspire real-world applications, and gather feedback for improvement.

Materials: Feedback forms

Equipment & Purchasing Links

1. Eitech universal lifting bridge/crane Kit Link