

Interreg VI – A Italia - Österreich  
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# Workshop Template - Battery Born, Battery Buried: EVs and the Environment

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Italia - Österreich



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**DOCUMENT APPROVAL**

Name	Organization	Role	Action	Date
Alexander Berndt	CUAS	Lead		

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Version	Date	Modifications	Authors
V1.0	28.07.2025	Initial idea and workshop layout	Gehan Dasanayake
V1.1	31.07.2025	Introduced new hands-on activity	Gehan Dasanayake
V1.2	02.08.2025	Updated list of Equipment & Purchasing Links	Gehan Dasanayake
V1.3			
V1.4			



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# 1. Introduction

The workshop “Battery Born, Battery Buried: EVs and the Environment” introduces students to the environmental challenges associated with electric vehicle (EV) batteries by applying the Life Cycle Assessment (LCA) method. It encourages students to consider what happens before and after a battery is used—from resource extraction to disposal.

To make this concept hands-on and age-appropriate, students conduct an experiment using the Kosmos “Limo Uhr” (Lemon Clock) kit. They build simple batteries using organic electrolytes such as lemon juice, Coca-Cola, and vinegar then measure their output with a voltmeter.

This accessible activity sets the stage for understanding how even basic devices require materials, energy, and choices that have a real environmental impact. Following this, students will explore the full life cycle of real EV batteries, covering material sourcing, manufacturing, usage, and end-of-life processes through a simplified LCA framework. This progression helps link everyday experiments with the complex realities of sustainable technology.

## 1.1 Learning Objectives

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

- Build and test natural batteries using common materials
- Measure and compare voltage using a voltmeter
- Identify and reflect on the environmental impact of each material used
- Understand and apply the Life Cycle Assessment (LCA)
- Compare basic battery setups to real-world systems like Lithium-ion and Ni-Cad batteries along with LCA
- Explore how batteries can be made more sustainable

## 1.2 Required Knowledge

No specialized background is required. However, participants will benefit from:

- Basic teamwork and communication
- Awareness of natural vs. synthetic materials
- Comfort with simple observations and descriptive recording

# 2. Workshop Structure

Table 1 Workshop Structure

Phase	Duration	Activities	Purpose	Materials
Opening	5 min	Welcome, brief overview of the EV theme	Set tone, engage curiosity, introduce sustainability in EV batteries	Slides

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Context Setting	5 min	Explain objectives, introduce Life Cycle Assessment (LCA) concept	Align expectations, establish relevance of battery sustainability, understand the full journey from raw materials to disposal	Slides, videos
Main Content	TBD	Build lemon, vinegar and cola batteries then apply LCA concept. Record voltage readings. Apply LCA framework to the built batteries then extend it to real EV batteries. Compare simple batteries to real EV batteries	Apply chemistry and observation skills. Prepare for LCA discussion. Compare simple batteries to real EV batteries	Kosmos kits, voltmeters, extracted lemon juice, orange juice, Coca-Cola, plastic cups
Wrap-up	10 min	Group discussion: environmental impact of each material; Students share findings, Collect feedback	Consolidate learning, gather insights, reflect on sustainability choices, encourage curiosity and discussion	Feedback forms, posters

## 2.1 Workshop Agenda

Table 2 Workshop Agenda

Phase	Duration	Activities	Purpose	Materials
Opening		Welcome, brief overview of the EV theme	Set tone, build interest in EVs and sustainability	Slides
Context Setting		Explain workshop objectives, introduce Life Cycle Assessment (LCA) concept	Align expectations, establish relevance of battery sustainability and life cycle thinking	Slides
Hands-on Battery Experiment		Build simple fruit-acid batteries using lemon juice, vinegar, and cola.  Use zinc and copper electrodes to measure voltage and observe reactions.	Introducing basic battery chemistry through experimentation. Compare acid performance and link results to sustainability using LCA thinking.	Slides, video  Kosmos kits, voltmeters, lemon juice, vinegar, Coca-Cola, orange juice, cups
Student Findings Presentation		Each group presents their voltage results, observations, and material impact with LCA findings	Practice communication, reinforce analytical thinking	Posters, slides

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Interactive Exploration		Facilitated interactive mapping session where students compare the life cycle stages of their lemon/cola battery to that of real EV batteries.	Develop systems thinking by connecting a hands-on experiment to real-world	Slides
Real-World Application		Apply LCA to real EV batteries using diagrams; compare with group battery findings	Connect small-scale experiment with global battery sustainability impact	EV battery diagrams, worksheets
Wrap-up		Collect feedback, reflect on sustainability choices and key learnings	Consolidate learning, gather insights, encourage future curiosity and responsible design thinking	Feedback forms, posters

## 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 (For Presenter)	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	Kosmos Battery Kits	1 per group	Assemble simple batteries with lemon, vinegar, cola, etc.	Homemade battery materials (copper, zinc, fruit)
	Voltmeter	1 per group	Measure battery voltage	Multimeter
	Plastic cups	~3 per group	Hold electrolytes (lemon juice, vinegar, cola)	Glass beakers
	Lemon juice / Vinegar / Coca-Cola/ Orange juice	Enough for experiment	Act as electrolytes in battery setup	Orange juice, soda water
Supplies	Markers, pens, pencils	1 set per team	Poster making, sketches, recording voltage and LCA results	Digital drawing tools

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	Poster paper	2 sheets per team	Present results visually (battery setup, voltage, LCA analysis)	Canva, PPT Slides, A3 papers
	Scissors, glue, tape	1 set per team	Assemble posters or secure battery elements	Pre-cut materials
Documentation	Feedback forms	1 per participant	Collect reflections and workshop improvement suggestions	Google Form, online survey tools
	LCA Lifecycle Posters	2–4 posters around room		

## 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

##### 3.1.1. Activities:

The workshop begins with a warm welcome and a short briefing on the central theme, Electric Vehicles (EVs) and their environmental footprint. Participants are prompted to think about the importance of batteries in modern technology and how they power more than just devices, they contribute to cleaner energy solutions.

To kick things off, an icebreaker or a brainstorming question like “Where does energy come from?” helps spark curiosity and peer discussion.

##### 3.1.2. Purpose:

This phase sets the tone, stirs initial interest, and frames the bigger picture of sustainability challenges in energy use. It also helps create a welcoming environment for exchange and participation.

### **3.1.3. Materials:**

Slides , battery visuals, or daily devices that use batteries

## **3.2. Context Setting**

### **3.2.1. Activities:**

The facilitator explains the workshop objectives and introduces the Life Cycle Assessment (LCA) concept. A short video and visual story illustrate how everyday products, especially batteries, have hidden environmental costs across their lifespan.

### **3.2.2. Purpose:**

To align expectations, establish relevance, and introduce life cycle thinking as a lens for evaluating sustainability.

### **3.2.3. Materials:**

Slides showing product life cycles (cradle-to-grave diagram) and visuals.

## **3.3. Hands-on Battery Experiment**

### **3.3.1. Activities:**

Students work in small groups to build simple batteries using household acids like lemon juice, vinegar, Coca-Cola, and orange juice. Using Kosmos kits or similar materials they insert metal electrodes (copper and zinc) into the liquids and measure the voltage output with a voltmeter. Each group tests two liquids to compare how different acids affect electrical output.

The groups record results in a table, labeling observations and discussing which material was most efficient.

### **3.3.2. Purpose:**

To give students a fun and tangible entry into battery science. It lets them observe basic chemical reactions, understand how batteries generate electricity, and introduce LCA thinking by discussing the source, use, and fate of materials like lemon or vinegar.

### **3.3.3. Materials:**

Kosmos Lemon Clock kits, voltmeters, cups, lemon juice, vinegar, Coca-Cola, orange juice.

## **3.4. Student Findings Presentation**

### **3.4.1. Activities:**

Each group presents their battery setup, voltage data, and LCA impact observations to the class for different liquids, including any notable phenomena (e.g., bubbling, corrosion) and initial thoughts on environmental impact. The facilitator may encourage students to connect their findings to various LCA stages such as sourcing, usage, and waste.

### **3.4.2. Purpose:**

To develop students' skills in scientific communication, teamwork, and reflection. This also serves as a transitional moment, linking the hands-on experiment with broader real-world sustainability conversations.

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### **3.4.3. Materials:**

Poster paper, optional slides or data tables to summarize class findings.

## **3.5. Interactive Exploration**

### **3.5.1. Activities:**

After presenting their natural battery findings, students engage in a facilitator-led discussion comparing their battery's life cycle with that of EV batteries. They collaboratively map each raw material to disposal analyzing differences in structure scale and environmental impact to bridge hands on learning with real-world sustainability challenges.

### **3.5.2. Purpose:**

To help students bridge their hands-on natural battery activity with real-world EV battery systems, using LCA comparisons to understand scale, environmental impact, and sustainability challenges.

### **3.5.3. Materials:**

Slides with battery lifecycle visuals, short videos (e.g., mining in Congo, EV battery recycling), printed LCA cards or flowcharts.

## **3.6. Phase: Real-World Application**

### **3.6.1. Activities:**

Students conduct a full Life Cycle Assessment (LCA) of EV batteries, using their earlier comparison between natural and EV battery raw materials as a reference. With the help of worksheets or diagrams.

### **3.6.2. Purpose:**

To bridge small-scale experimentation with global-scale impact, showing students how scientists and engineers analyze the sustainability of complex systems like EV batteries.

### **3.6.3. Materials:**

EV battery lifecycle diagrams, printed worksheets for LCA stages, sample EV component illustrations.

## **3.7. Phase: Wrap-up**

### **3.7.1. Activities:**

Students may write down or discuss their key takeaways: “What surprised you the most?”, “What would make a battery more sustainable?”, or “How can we reduce battery waste?”. Optional poster-making or feedback forms can be used. Collect final feedback and reflection.

### **3.7.2. Purpose:**

To consolidate learning, encourage reflection, and give students the opportunity to connect science to personal and global choices around sustainability and technology.

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### 3.7.3. Materials:

Feedback forms, summary posters, optional slides with key takeaways.

## 4. Equipment & Purchasing Links

### 4.1. Lime clock battery experiment kit

<https://www.thalia.at/shop/home/artikeldetails/A1058946052>

### 4.2. Plastic cups

[https://www.pagro.at/heku-trinkbecher-200-ml-50-stueck-weisz-4018164004211.html?gad\\_source=1&gad\\_campaignid=17347809968&gbraid=0AAAAADLmnIVNNykovfxnniA1TaOYzOhz8&qclid=CjwKCAjw7rbEBhB5EiwA1V49nWqwbUw5FHBtDHmldGvgXAmH3vGF5AXdtz\\_NsQldbsngj67undStGRoC-8oQAvD\\_BwE](https://www.pagro.at/heku-trinkbecher-200-ml-50-stueck-weisz-4018164004211.html?gad_source=1&gad_campaignid=17347809968&gbraid=0AAAAADLmnIVNNykovfxnniA1TaOYzOhz8&qclid=CjwKCAjw7rbEBhB5EiwA1V49nWqwbUw5FHBtDHmldGvgXAmH3vGF5AXdtz_NsQldbsngj67undStGRoC-8oQAvD_BwE)

### 4.3. Oranges, Limes, Coca Cola (Regular), Vinegar

### 4.4. Voltmeter

### 4.5. Connecting cables (Banana/Crocodile connections)