

CONCEPT NOTE:

Circularity of Electric Vehicle Batteries: from Materials and Manufacturing to Recycling

Four-part technical training series for the Leadership Group for Clean Transport in Asia

Date: May 2nd, 2023

Purpose of the concept note:

This concept note describes the *first training series* for members of the “Leadership Group for Clean Transport in Asia”, an initiative by the Global Climate Action Partnership. Upon listening to our member countries priority impact areas and preferred modalities of support, this training series was specifically designed to support in-country and regional key policy and technical leads achieve ambitious impacts working towards a clean and sustainable transport sector.

The training series consists of four phases that will be implemented across six months in 2023 and will be open to all Leadership Group Points of Contacts and their colleagues. The training will kick off with a virtual training session (May and June 2023), which will be followed by knowledge sharing events (Q3 2023) and will culminate in an in-person training and study tour (Q4 2023).

Background:

Launched in 2011, the LEDS GP (Low Emissions Development Strategies – Global Partnership), now the Global Climate Action Partnership (GCAP) network brings together over 4,700 members to facilitate peer learning, technical collaboration and information exchange. GCAP’s work is primarily implemented via regional platforms in Africa, Asia, and Latin America and the Caribbean and associated Communities of Practice (CoPs) and Leadership Groups that focus on specific topics such as e-mobility, mini-grids, private sector engagement, bioenergy, and clean mobility. The ultimate goal is to support regions raise climate goals and actions through advanced policies and implemented projects.

In Asia, the ‘Leadership Group for Clean Transport in Asia (LG-CTA)’, was established in June 2021 as a mechanism to support technical and policy leads from member countries that have come together as a collaborative group to work towards cleaner and sustainable transportation in the region. The LG-CTA is an membership-based group of policy and technical leads, who will be supported with multilateral activities (e.g. capacity building workshops, technical trainings and study tours, peer learning) on topics that are identified and prioritized by member countries (e.g. transport and associated sectors including energy and buildings). All activities have a strong link building regional synergies, while leading to impacts in policy and project implementation. Activities within the

LG-CTA engage high-level government officials with specific interests to advance activities with integrated policy and technical elements with the goal of maximizing regional impact.

The three main objectives of the LG-CTA:

- Develop shared goals and visions for transformation of transport systems in the region
- Develop and strengthen pathways to achieve transitions toward net zero transport systems at national and sub-national levels, and across the region
- Implement actions consistent with these goals and pathways, through regional trainings and peer collaboration and learning

The LG-CTA is one of the central Regional Engagement Frameworks of the Asia LEDS Partnership, each of which is designed to reach a specialized target audience that will consequently result in specific high-impact outcomes. The LG-CTA is an membership-based team of policy and technical leads, who will be supported with multilateral activities (e.g. capacity building workshops, technical trainings and study tours, peer learning) on topics that are identified and prioritized by member countries (e.g. transport and associated sectors including energy and buildings). Members will be offered technical advisory support to member countries via GCAP's Climate Action Accelerator (<https://ledsgp.org/climate-action-accelerator/>) on topics that align with the leadership group's technical workplan. Outcomes from these advisory technical support will be shared with the group for replication of learning and good approaches. All activities have a strong link building regional synergies, while leading to impacts in policy and project implementation.

The LG-CTA strategy amplifies synergies in the following areas (based on regional priorities from the second Roundtable Dialogue) to support a focus on a clean and just energy transition for transport in the Asia region:

- Delivering knowledge products and engagement opportunities that support implementation of just energy transition for the transport sector as a regional umbrella to bring together a number of specific LG-CTA country priorities.
- Realign ongoing transport-energy efforts toward scaling up renewable energy integration in the transport sector and phasing out fossil-fuels, as reflected in the COP27 call to accelerate development, deployment and dissemination of technologies and transition toward low-emission energy systems.
- Build upon existing commitments such as strengthening international assistance to the transition to Zero Emission Vehicles in the Global South; explore membership in the Beyond Oil and Gas Alliance; and support the Just Energy Transition Partnership for Indonesia launched at the G20 Summit in 2022.

Activities will include integrated policy and technical elements with the goal of maximizing regional impact. The proposed training series described in this concept note will focus on the circularity of EV batteries, in the context of supporting the regional strategy to focus on local manufacturing and assembly of 'green' vehicles, either electric 2- and 3-wheelers and, as feasible, manufacturing of electric buses and 4-wheelers and batteries one of the most important core components of all these vehicles. This technical topic and approach is grounded in the broader goals of furthering energy independence and workforce development in LG-CTA participating countries.

Leadership Group:

An increasing number of national policies, strategies and/or plans in Asia demonstrate a commitment to expanding clean transportation and optimize local production and assembly (**Table S1**). For example, India's policy Faster Adoption and Manufacturing of (Hybrid and) Elective Vehicles (FAME) is now in a second phase (FAME II) (1). However, achieving expanded use of electric vehicles requires increased knowledge around the supply chain, materials, manufacturing and recycling of EV batteries.

During the Roundtable Dialogue in 2022, multiple countries in the region have communicated a strong interest in multiple aspects of and a need for capacity building related to EV batteries, including recycling and disposal, swapping policies and standards, and workforce development (**Table 1**). Realizing a consistent supply of EV batteries requires knowledge about the supply chain to understand and manage the full circular economy from battery production to re-use and the recycling of critical minerals (1, 2).

Table 1. Priority subtopics around EV batteries and related workforce development needs, based on information gathered from participants at Leadership Group 2nd Roundtable Dialogue in September 2022.

Priority Topics	Sub-topics within each impact area	Countries Expressing Interest
EV Batteries	<ul style="list-style-type: none"> Battery disposal, recycle, critical mineral extraction, swapping policy and technology 	5: Bangladesh, Bhutan, Laos PDR, Sri Lanka, Thailand
	<ul style="list-style-type: none"> EV batteries standard, harmonize in region 	3: Bangladesh, Laos PDR, Philippines
Workforce Development	<ul style="list-style-type: none"> Capacity Building on safe EV inspection, testing and maintenance 	5: Bangladesh, Bhutan, Laos PDR, Sri Lanka, Thailand
	<ul style="list-style-type: none"> Training technicians and other actors in repair/accident value chain 	2: Bangladesh, Philippines

Training Program Objectives:

This concept note outlines a **multi-phased training program** that addresses critical topics associated with EV batteries, starting from understanding supply chain to end of life considerations. All activities within this series is open to all LG-CTA member countries and the training series objectives are:

- Capacity building for policy and technical decision makers to develop new policy/regulatory ideas around the circularity of EV batteries, ranging from supply chain to recycling considerations.
- Support member country stakeholders to identify national/regional gaps and brainstorm ideas for new solutions. Increase understanding of aspects related to EV circularity, including
 - Manufacturing, assembly, supply chains
 - Lifetime and performance assessment
 - Secondhand use options for batteries and valuation of secondhand use EV vehicles
- Enhance regional peer-learning, where countries at an advanced stage will share lessons and good practices to support emerging countries carve their own agenda
- Generate ideas and plans for workforce development curricula
- Generate new modeling and analysis tools customized for the region
- Identify country specific topics for technical assistance and support in a regional context

Approach:

We propose a multi-phase multilateral technical training program to build knowledge and capacity of policymakers and practitioners on EV battery key concepts and technical tools that will support decision makers (**Table 2**). The program is structured to address key sub-topics as well as train the use of EV battery tools (**Table S2**) developed by NREL with support from the US Department of Energy. The program consists of a series of virtual and in-person technical trainings, and a site visit to a facility in the region engaging in battery manufacturing and/or repurposing. The training program will be designed and presented to participants as a multi-phased program to cover integrated topics along the circular economy of EV batteries which are interconnected and necessary for planning and implementing low emission development strategies.

To establish optimal impacts of the training series, attendees will be requested to propose how the training series will inform their current roles developing an action plan. At each phase, this could consist of discussions and survey tools to identify how participants might use content within the trainings and will culminate in each participating country providing a draft action plan to propose on how the training series has informed or will inform any policy or project goals. The implementing partners (IPs) will synthesize and report on the intended outcomes and impacts of the activities.



Figure 1. Training program phased structure, which allows for integrated knowledge and capacity building across multiple key sub-topics of EV batteries using multiple formats.

Phase 1: Battery circularity principles: Total EV battery circularity & EV battery lifetime, performance, secondary use

The two-part **virtual training will** build knowledge and capacity to understand key concepts related to the full circular economy for lithium-ion batteries, including supply chain challenges, as well as evaluate EV battery lifetime, performance, and secondary use. NREL experts will present the Lithium-ion Battery Resource Assessment Model ([LIBRA](#)) tool, as well as [BLAST](#). **Training Agenda is shown [here](#).**

Phase 2: Regional peer-learning: Front runner countries share lessons and best practices

The second phase focuses on peer-learning, specifically from front-runner countries in the region and topics will build on replicable good practices, policies and impacts. The topics will show-cased at a Clean Energy Ministerial (CEM) session to be held in Goa, India in July 2023, which will be an **in-person peer-learning and knowledge sharing session**. This session may coincide with the G20 series of events in India (July 2023) and will include key regional speakers.

Phase 3: Study tour: Visiting front-runner country facilities and sites

An **in-person training and study tour** will focus on key concepts and best practices related to battery manufacturing and assembly, supply chains, and policies on EV battery circularity, and include a site visit to battery manufacturing or recycling and testing facility. The Asia LED Platform’s (ALP) 2023 Forum is expected to be held in Oct of 2023, and will include focal discussions and trainings on transport and energy, culminating in a study tour. The three-day ALP forum is expected to be held in New Delhi, India.

Phase 4: Training program review and next steps

A **program review** by IPs and LG-CTA members will be held virtually, will evaluate the format of the training, the knowledge shared, the impacts of the training program and identify how to adapt this training program to other priority topics. Member feedback will be critical for this review, to be able to better support our partners in upcoming trainings. Training program timeline is shown below.

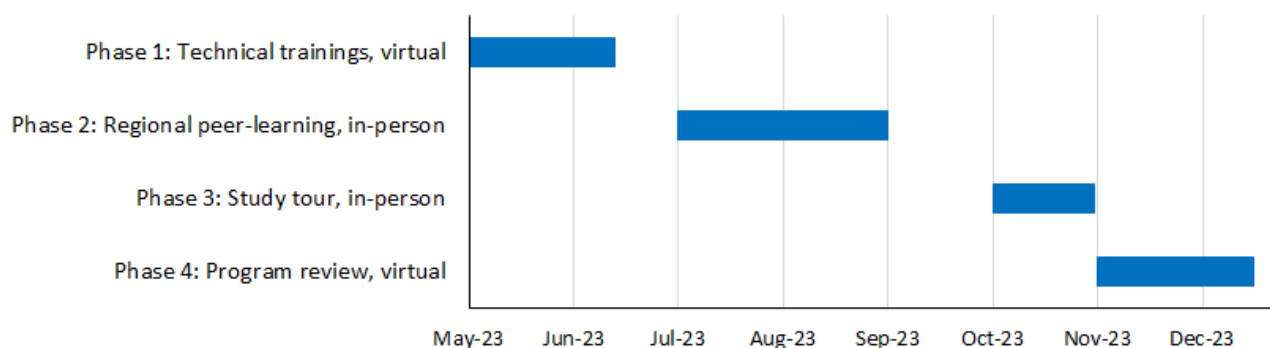


Figure 2. Timeline for EV Battery Technical Training Series. Planned timing for some activities is estimated.

Participation:

We would like our member countries to strategize about continuity of participants throughout the whole training series (i.e. virtual, in-person and study tour), so as to maximize knowledge aggregation and bring it back to the ministries for impactful follow up actions.

(1) Phase 1: May-June 2023, for the upcoming 2-part virtual training:

- Points of contacts for each LG-CTA member country will be invited to bring up to **6 additional colleagues** to the virtual training. We encourage POCs to consider;
 - policy leads
 - technical leads
 - participants from academia or technical/vocational institutes who could help create new local knowledge hubs.
- Registration is required - [please register here](#).
- PowerPoint slide decks of all the presentations will be provided to all participants

- Participants are required to fill a survey prior to the event, which will enable the IPs to better engage in technical topics during the trainings.
- Two optional virtual pre-meeting is set, in case any members have questions about participation across any of the trainings.
- Virtual training Agenda can be found [here](#).
- LG_CTA POC's will be asked to develop an action plan, which are the next steps the participants are excited to embark on as a result of this training.

(2) *Phase 2: July 2023, for the upcoming CEM side-event:* This is yet to be finalized

(3) *Phase 3: Oct 2023, ALP forum and study tour:* Participation by two or three members from each member-country are expected.

Activities for entire training program:

Table 2. Program in multiple phases to inform on key subtopics of EV battery charging

Phase	Activity	Content	Details	Timeline
	Optional, Introductory Virtual Session to Entire Training Series	Introduction to Training Series <ul style="list-style-type: none"> • Present scope, key concepts, participant expectations • Not mandatory - Implementing partners will be available to answer any programmatic questions 	<ul style="list-style-type: none"> • 1 hour • Optional for points of contact • IPs will be present to answer any questions 	8.00-9.00 A.M. India Standard Time, 11th and 18, May 2023
1A	Session A: Technical training (virtual)	Total EV battery circularity <ul style="list-style-type: none"> • Key concepts • NREL tool: LIBRA - addresses and quantifies manufacturing needs, supply chain, critical minerals, recycling plants and capacity, key aspects for policy leads • Survey participants about sub-themes to evaluate needs for subsequent trainings 	<ul style="list-style-type: none"> • 2.5 hours • LG-CTA POC and up to 6 more colleagues - practitioners, policymakers 	8.00 - 10.30 AM, India Standard Time, 31st May 2023
1B	Session B: Technical training (virtual)	EV battery lifetime, performance, secondary use <ul style="list-style-type: none"> • Key concepts • NREL tool: BLAST - Simulates lifetime and performance based on local environmental conditions <ul style="list-style-type: none"> • Open-source software • Survey participants about sub-themes to evaluate needs for other trainings 	<ul style="list-style-type: none"> • 2.5 hours • LG-CTA POC and up to 6 more colleagues - practitioners, policymakers 	8.00 - 10.30 AM, India Standard Time, 6th June, 2023
2	Peer-learning and Knowledge sharing session (in-person)	Key member countries share knowledge and good practices: topics could be related to battery circularity	<ul style="list-style-type: none"> • CEM Member countries traveling to event will be invited to participate 	Goa-India, G-20 series of events, July 2023

		<ul style="list-style-type: none"> Key speakers: potentially India, Indonesia or other participants of the CEM event CEM - side event: Exercise and peer exchange led by LG-CTA members with workshop participants to translate outcomes of LG-CTA technical trainings (May-June) into high-level policy direction. 	<ul style="list-style-type: none"> Policy best practices Understanding additional technical needs Sharing lessons learnt 	
3	In-person training and Study tour (in-person)	<p>Battery manufacturing, assembly, supply chains, policies around EV battery circularity</p> <ul style="list-style-type: none"> Training and Study Tour: <ul style="list-style-type: none"> A 2-day ALP forum is being planned for Oct of 2023 and the event will focus on the 2 primary technical workstreams, energy and transport for Days 1 and 2. On the 3rd day, study tours will be planned. 	<ul style="list-style-type: none"> 3 days LG-CTA – practitioners and policymakers and other national leads ALP forum will be 2-days, focusing on transport and energy Sites visit locations TBC New Delhi, India 	October 2023
4	Review of training series (virtual)	<ul style="list-style-type: none"> Program review by IPs and members countries Can this model training series be replicated for other topics and impact areas? Seeking suggestions for improvements and greater impacts. We need to understand what members will do with the learnings? Is this format a good support for our members countries? 	<ul style="list-style-type: none"> 2.5 hours LG-CTA member POCs All IPs will be present Members will provide feedback for IPs 	Nov-Dec 2023

Implementing Partners POC's for any questions:

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